The Forest Trees Of Ontario

And The More Commonly Planted Foreign Trees

A Guide To Their Identification With Illustrations

By
The Late J.H. White, B.Sc.F., M.A., Ph.D.
Professor of Forestry, University of Toronto

Fourth Edition Revised by
The Late R.C. Hosie, B.Sc.F., M.A., R.P.F.
Professor Emeritus of Forestry, University of Toronto

Ontario
Ministry of Natural Resources
Hon. Vincent G. Kerrio
Minister
Mary Mogford
Deputy Minister

©1986, Queen's Printer for Ontario
Printed in Ontario, Canada

THE FOREST TREES OF ONTARIO

First edition, 1925	25,000 copies
Second edition, revised, 1946	25,000 copies
Third edition, 1957	25,000 copies
Fourth edition, revised, 1968	25,000 copies
Fifth edition, 1973	25,000 copies
Sixth edition, 1977	15,000 copies
Seventh edition, 1980	15,000 copies
Reprinted, 1986	10,000 copies

Current publications of the Ontario Ministry of Natural Resources, and price lists, are obtainable through the Ministry of Natural Resources Public Information Centre, Room 1640, Whitney Block, 99 Wellesley Street West, Toronto, Ontario M7A 1W3 (personal shopping and mail orders).

And:

Personal shopping: Ontario Government Bookstore, Main Floor, 880 Bay Street, Toronto.

Mail Orders: MGS Publications Services Section, 5th Floor, 880 Bay Street, Toronto, Ontario M7A 1N8. Telephone 965-6015. Toll free long distance 1-800-268-7540, in Area Code 807 dial 0-Zenith 67200.

Cheques or money orders should be made payable to the Treasurer of Ontario, and payment must accompany order.

TABLE OF CONTENTS

		Pages
1.	Preface to the Fourth Edition	4
2.	Foreword to the First Edition	5
3.	The Importance of the Forests	7
4.	Ontario Forest Regions	8
5.	The Distribution of Forest Trees	9
6.	Names of Trees	11
7.	Classification of Trees	12
8.	Helps in Studying Trees	13
9.	How to Use Keys for Identification	17
10.	Key to Native Evergreen Trees	17
11.	Key to Native Broad-leaved Trees in the Leafy Condition	18
12.	Key to Native Broad-leaved Trees in the Leafless Condition	21
13.	The Evergreen Trees with Illustrations	24
14.	The Broad-leaved Trees with Illustrations	38
15.	Meanings of Special Terms	105
16.	Illustrations of Winter Twigs	108
	Index	115

PREFACE TO THE FOURTH EDITION

In the preparation of the fourth edition of "The Forest Trees of Ontario", the format of the original edition has been altered slightly, to permit the inclusion of family names and the genera contained in each. The descriptions of trees have not been changed, and the original method of comparing species that are apt to give trouble to anyone wishing to become acquainted with our trees, has been preserved since it is believed to be one of the most useful aids in the recognition of different species.

No attempt has been made to include the many varieties and forms of common species that in recent years have been recognized by different botanists. It is felt that the main Ontario species are the trees that should first be recognized, and that the finer distinctions of variations from these, by introducing varieties, would hinder rather than help in this.

The changes that have been made in this edition include: the addition of a map of Ontario showing the three forest regions in the province, and the locations of some of the places referred to in the text. This should be helpful to the reader in connection with the distribution of the different species.

The list of illustrations (at the beginning of the book in previous editions) has, in this edition, been included within the index. The llustrations themselves (designated Figures in the text and previously all together at the end of the book) are now, with the exception of those of the twigs, separated out and appear in the text close to the descriptions of the tree material they depict. It is hoped that this change will make for easier and more profitable use of the book.

Five species of trees have been added to the previous total of 84, so that recognition is given to the probability of there being about 90 native forest trees in Ontario, exclusive of the Hawthorns. The species added are Rock Chestnut Oak, Wild Plum, Showy Mountain Ash, Prickly-Ash, and Roughleaf Dogwood. These have been seen in the field personally with the exception of the dogwood, and material of it, collected in the extreme southern portion of Ontario, has been examined.

There have been some changes in the scientific names of a number of species. Previous editions followed the nomenclature of the Vienna or International Code with changes in some cases to conform with the American Code which was in general use on this continent for a number of years prior to 1950. With the publication in 1953 of Agricultural Handbook No. 41, prepared under the direction of the United States Forest Service, by Elbert L. Little, Jr., there was initiated a means of attaining uniformity in the names of trees in this country, and in this edition of "The Forest Trees of Ontario", the nomenclature (except exotics) conforms to that given in this U.S. Forest Service publication titled, "Check List of Native and Naturalized Trees of the United States (including Alaska)".

The statistical matter in the text has been almost completely removed, it being felt that as time passes, figures depicting volumes of wood cut become less and less representative and are soon valueless and may even become very misleading.

It is hoped that the book will continue to be useful and, in the words of the first author, "make it easier for people to become personally acquainted with our trees".

Toronto, April, 1968. R. C. H.

FOREWORD TO THE FIRST EDITION

Twenty-four years ago, Dr. W. H. Muldrew, a well-known Ontario educationist and naturalist, issued the first tree book of the province, entitled "Sylvan Ontario — A Guide to Our Native Trees and Shrubs." This was a very useful publication, filling a long-felt want, but has been out of print for many years.

The present bulletin contains brief descriptions of the native forest tree species of the province, accompanied by illustrations of their leaves, fruits, winter twigs, and in some cases of the flowers where considered useful.

In addition, there are included notes on the more common foreign trees planted in our parks and along streets; this is because the majority of people encounter these to such an extent. Four of them are illustrated, because of their use in reforestation work.

The descriptions are based on the tree material used in the training of students at the Faculty of Forestry of the University of Toronto. These have been checked back with the works of Sargent, Blakeslee and Jarvis, Illick, Gray, Brown, and others. To all these, I wish to express my indebtedness.

The illustrations are from photographs of material largely freshly collected for the purpose. To various friends who co-operated in the securing of this material, I extend my sincere thanks.

The photographs were made by the Department of Photography at the University of Toronto. The writer wishes to record his appreciation of the co-operation of this staff in the work, and of the excellent photographs achieved. Only those who have tried it know what difficulties are encountered in photographing tree material, especially leaves.

All the forest trees described have been observed in the field personally, with the exception of two — the Red Mulberry and the Mockernut Hickory. Authentic material of the former collected in Ontario has been seen, and the Mockernut is included because of the records of collection.

The purpose of the bulletin is to make it easier for people to become personally acquainted with our trees. It is believed that the securing of the interest of the people of the province in trees will be an aid toward an understanding of the importance to us of our forests, and thus pave the way for support of forestry principles.

With this in mind, the descriptions have been written in non-technical language within the reach of older school children, although the use of a certain number of new terms is unavoidable. There has been no attempt at complete descriptions; rather the aim has been to present the main recognition marks for leaf, fruit, or twig, as the case may be.

Along with the descriptions are included the chief facts about the properties and uses of the leading species. The accompanying statistical facts are taken from bulletins of the Dominion Bureau of Statistics.

Easily used keys are given to enable the reader to identify quickly any native tree. There is a chapter telling how to approach the task of distinguishing trees, and where to look for differences; also explaining the common technical terms. The same type of assistance is attempted in dealing with each tree or group of trees in the main text.

A cheap magnifying glass of about nine diameters will be found helpful with many features, and a necessity in some cases.

It is hoped that the bulletin will combine "instruction with recreation" for all who care to go rambling among the trees.

Needless to say, there will be slips and inaccuracies in the mass of detail included. The writer will be glad to have these brought to his notice.

J. H. W.

Toronto, October, 1925.

THE IMPORTANCE OF THE FORESTS

The forests of Ontario are vitally important to the people of the province in numerous ways.

In the first place, they furnish supplies of wood which are just as essential to us as food. Each year, we require large quantities of lumber, veneer, ties, poles, posts, shingles and other products of the sawmill industry, as well as paper of various kinds and in many forms, produced by the pulp and paper industry. Without our forests we would need to buy these wood necessities or substitutes elsewhere.

In the second place, forests afford a means of livelihood to many thousands of persons. To begin with, they provide a direct return in salaries and wages in connection with the production of logs and their removal from the forests. Further employment is afforded to the employees in the various mills which convert these logs into lumber, pulp, paper, etc. Much of that mill product passes in turn to the various secondary wood-using and paper-using industries of the province. There, its further manufacture employs as many persons as the mills, with corresponding earnings. These earnings, and the capital invested in the necessary plants and equipment needed to produce them, amount to many millions of dollars.

In the third place, forest products have always formed a large share of our export trade with other countries. They are of greater importance than the products of mining and agriculture in helping to maintain a favourable trade balance.

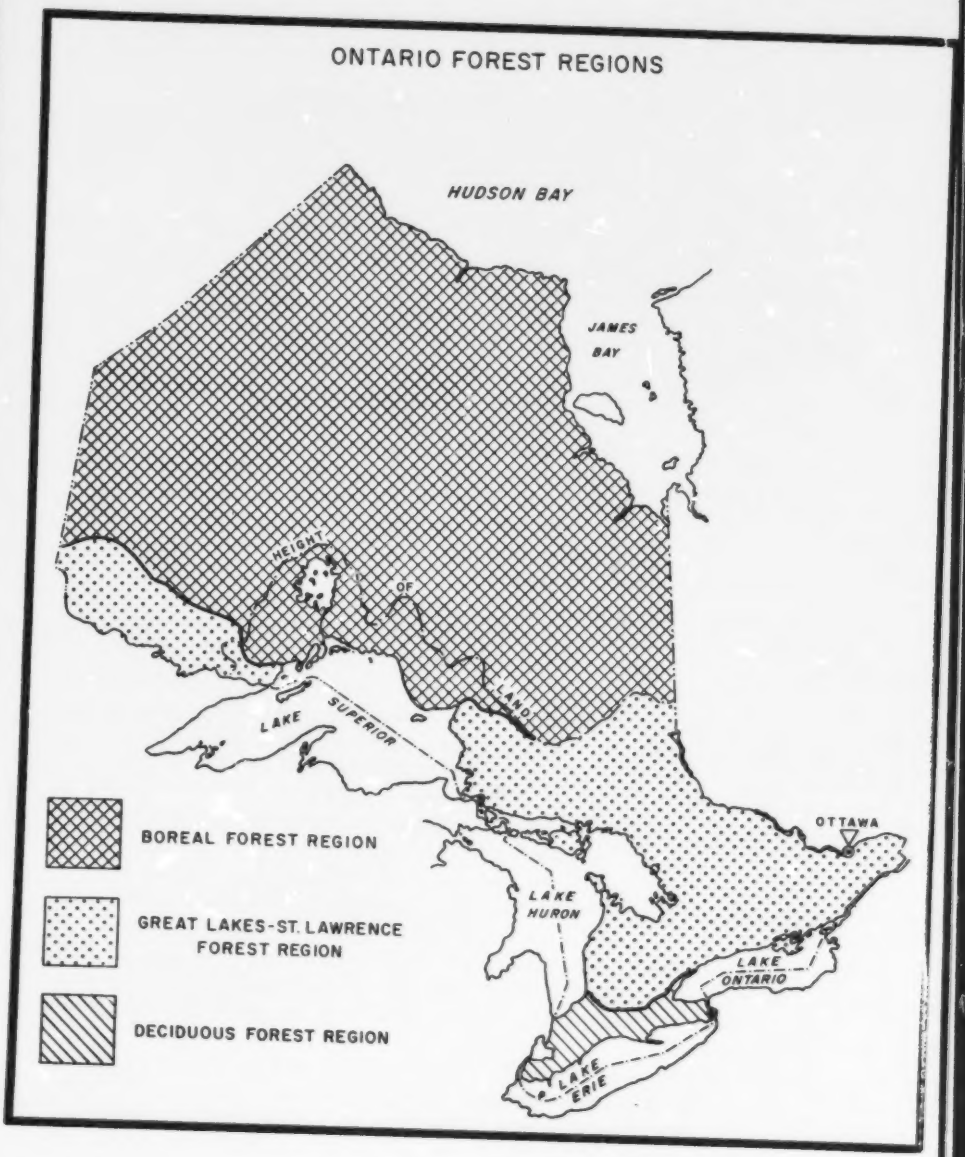
In other less direct ways, the forests are of value to us. In the case of a forest-covered soil, surface run-off of water from rain and snow is reduced, and more water seeps into the underground drainage than is the case with a bare soil. The result is a tendency to equalize stream flow, to reduce the gap between high and low water stages, and to lessen the probability of floods. Then, too, it has always been recognized that a dense forest cover is the most efficient protection against gullying and erosion of slopes.

Lastly, the relation between forest, fish and wildlife is common knowledge. Not only do these latter give rise to their own industries, but they are a big factor also in our tourist industry.

Thus, we see that forests are an important factor in the financial affairs of many people, and that they are the basis for a very large part of our prosperity. So long as we have forests like those which now provide us with the logs for our mills, this prosperous condition can continue.

In our forests, along with the stands of mature timber now being harvested, are immature stands which have developed, unaided by us, on land from which the trees have been harvested or otherwise cleared. If our forest industries are to be maintained, it is essential that these young forests be not only protected from fire but extended, and in some areas supplemented with exploitable species; continuous tree cropping must be the principle.

One of the great problems in connection with these young forests is to protect them from fire. Every summer, large areas of forest land are burned over in the province as a consequence of human carelessness and bad judgement. The co-operation of everyone to be careful with fire in the woods is a public duty. It must always be borne in mind that much more of the land area of the province is fitted for growing trees rather than for agricultural use.


ONTARIO FOREST REGIONS
HUDSON BAY
JAMES BAY
HEIGHT OF LAND
LAKE SUPERIOR
OTTAWA
LAKE HURON
LAKE ONTARIO
LAKE ERIE
BOREAL FOREST REGION
GREAT LAKES-ST. LAWRENCE FOREST REGION
DECIDUOUS FOREST REGION

THE DISTRIBUTION OF FOREST TREES

Ontario, the second largest province in Canada, stretches roughly 1,000 miles from north to south, and an equal distance from east to west with an area somewhat over 400,000 square miles. This is equivalent in size to three and a half times the combined areas of England, Wales, Scotland and Ireland. The province is often spoken of as two sections: Southern or Old Ontario lying south and east of Lake Nipissing; and Northern or New Ontario, the remainder.

Of this immense area, it is estimated that some 198 million acres is forest land, with slightly more than half of it productive. This area of forest land is equal to one-half the forest area of all the countries of Europe, exclusive of Russia. It is equal to seven times the forest area of France, or three times that of Sweden.

The forest throughout this vast extent includes about 90 kinds of trees, exclusive of the hawthorns, and shows well-marked differences in the occurrence of these, as one travels from south to north. This is due to differences in climate and soil. Accordingly, we can classify the forest into different kinds or types.

The main agricultural section of southern Ontario was once in general a hardwood forest, which has to a large extent been cleared away to give room to farms.

In the southern peninsular portion of this section — approximately south of a line drawn from the lower end of Lake Huron to the western end of Lake Ontario — all our species of hardwood or broad-leaved trees are to be found, with the exception of a very few, as for example striped maple and mountain ash. Further, quite a number of these are not to be found growing naturally outside the district, farther to the north. This is the case, in general, with certain oaks and hickories, chestnut, mulberry, cucumber-tree, tulip, papaw, sassafras, red-bud, coffee-tree, honey locust, hop-tree, flowering dogwood, blue ash, hackberry, black gum, sycamore and walnut. These are species of the great deciduous forest to the south of us that find their northern limit of growth in southern Ontario. Thus, we can separate off this portion of the province as the Deciduous Forest region in Ontario and the forest type as the Southern Hardwoods.

Throughout this region, the evergreen trees are much less in evidence, being restricted to the more sterile soil areas. The number of kinds to be encountered is also limited, only about one-half the evergreen species coming so far south.

The remainder of the general hardwood region — roughly north to a line from the southern end of Georgian bay to Ottawa — includes fewer kinds of hardwood trees, owing to the absence of the less hardy ones mentioned above. Maple, elm, beech, basswood, birch, oak, ash, and hornbeam are the common species.

The evergreen trees occur more frequently in this area, especially in the northern part, but the forest is essentially a hardwood type and is generally referred to as the Northern Hardwoods.

Passing farther north, the number of hardwood species becomes smaller as trees such as white oak, white ash, beech, and basswood drop out. In addition, the evergreen percentage of the forest on the whole increases. The common species met with are white, red and jack pines, white and black spruce, hemlock, balsam fir, white cedar, sugar maple, yellow and white birch, and poplars. This part of the forest may be classed as a Mixed Conifer-Hardwood type.

The area occupied by these two types of forest, the Mixed Conifer-Hardwood

and the Northern Hardwoods that blends into it, is known as the Great Lakes-St. Lawrence Forest region. It is an immense tract of land, bounded on the north by a line from a point on the east boundary of the province, about midway between Lakes Abitibi and Timiskaming, west to the Lake-of-the-Woods area on the province's west boundary.

Throughout most of the region, the country has a low, hummocky topography with countless lakes and branching streams in the valleys between the hills. The surface is rocky and the soil very shallow, so that it is only to a limited extent suited to agriculture. In the past, it was the most important forest region in the province since it has been the basis of our once great lumber industry and to a large extent the pulp and paper industry, since the beginning.

As we pass down the Height of Land on the northern slope into the Northern Evergreen Forest, we enter Ontario's most extensive forest area, but a forest with relatively few species. The hemlock, white and red pine, and most of the remaining hardwoods, such as red oak, sugar maple, yellow birch, white elm, and black ash, disappear from it. All that remain are white and black spruce, balsam fir, jack pine, tamarack, white cedar, white birch, aspen, and balsam poplar. Finally, as one approaches the southern shore of Hudson Bay, only white and black spruce, tamarack, and poplar are to be found. This area is known as the Boreal Forest region and, except in the far north, contains the most highly productive plupwood stands in the province.

Thus, we can roughly say that the forest area of Ontario is mainly one of mixed hardwood and evergreen species, lying between a hardwood forest in the south and an evergreen one in the far north.

NAMES OF TREES

Every tree has both a scientific name and a common name, or often several common names.

The use of common names is often troublesome. To a considerable extent they are local in their use, and the same common name is applied in different localities to very different trees, frequently. Speak of an ironwood, and one person thinks of the hornbeam at the same time that the individual standing next to him is thinking of the blue beech. Then, of course, there is the trouble with the different languages of the various countries.

This confusion is overcome by using scientific names in Latin, a dead language. This gives a universal name, understood all over the world as applying to one particular kind of tree.

This name consists of a genus name first, followed by the species name, and then the abbreviated name of the scientist who first described the tree. The genus name is a group name, signifying that all the trees with that name have certain similarities in their flowers, fruit, etc.; and the species names cover the different members of the group. Thus, in a household, Smith would be a genus name, while James, John and Charles would be species names. Betula is the genus name for all birches the world over, while lutea means yellowish, and papyrifera means paper-bearing. Hence, Betula lutea is the scientific name for our yellow birch, and Betula papyrifera for our paper or white birch. It is customary, after the genus name has been used once, to abbreviate it to the first letter in further use of it in the same general connection.

Where two or more genera bear a close relationship, they are grouped together into a family. For example, the genus Populus, the poplars, and the genus Salix, the willows, are so much alike in their flower and fruit characters, and in other ways that they are placed in the family Salicaceae. In like manner, other genera become members of families. In the descriptions of the trees that follow in the text, the families to which the different genera belong are indicated, since at times they are helpful in the determination of the species.

The genus names are mainly early Latin, while the species names usually refer to some characteristic feature of the tree, but at times are geographical or commemorate some individual. The significance of the species names of the former class appears in the text.

The nomenclature used is, except for the exotic species, according to the U.S. Agriculture Handbook, No. 41, 1953. That for the exotics is in the main according to the Vienna or International Code.

CLASSIFICATION OF TREES

The arrangement of the species described in the text follows the generally accepted natural order. This is founded on the probable order of descent from an ancestor as indicated by the structure of the reproductive organs, the flowers. In this, it is conceded that conifers are of very ancient origin and probably antedate the broad-leaved trees. They are therefore placed first in the order of the trees. The willows and poplars, considered the most primitive of the broad-leaved trees, follow the conifers. Then follow the walnuts, the hickories, the birches and their allies, hornbeam, blue beech, and alder, and in this manner on through to the ashes and nannyberry at the end.

HELPS IN STUDYING TREES

In comparing two trees in order to decide whether they are the one kind or different species, we can use for this purpose their leaves, flowers, fruits and seeds, twigs, barks, as well as other less evident features. The ways in which these parts may be dissimilar on different kinds of tree are pointed out in the following paragraphs. This will be a guide in examining material from two trees from a comparative standpoint, and of help in interpreting the descriptions of the trees which follow later.

The discussion refers only to broad-leaved trees. The features of the evergreens are covered in the key to that group and the section headed "Evergreen Trees."

I. LEAF

A leaf consists of a flattish portion, spread out over the veins and known as the blade; a stalk or petiole, often very short; and usually a pair of small leaf-like structures at the base of the stalk, which are called stipules. These latter generally fall off early in the season.

Leaves on different kinds of tree differ mainly in their shape, kind of margin, method of arrangement on the branchlet, and whether the flattish part is divided into separate pieces or not. To describe these differences precisely, the use of a certain number of special terms is unavoidable.

1. ARRANGEMENT OF LEAVES. — Where there is but one leaf at a point on the stem, the position is described as alternate. With two leaves at the same level on the stem and placed opposite each other, the arrangement is opposite, as in the maples. If there are more than two leaves at the one point, they are said to be whorled. The part of the stem where leaves originate is called a node, and the region between two nodes an internode.

The alternate arrangement is by far the commonest on our trees, and in this bulletin it is to be understood that this is the case unless otherwise mentioned. In the winter, the arrangement of leaves is indicated by the leaf-scars on the twig.

2. TYPE OF LEAF. — If a leaf has its blade divided into portions which are separate from one another, it is spoken of as a compound leaf, and the portions as leaflets (Figs. 145, 157, 185); otherwise, the leaf is a simple one.

There are two forms of compound leaf — pinnate, when the leaflets are arranged along opposite sides of the stalk, as in Fig. 145; and palmate, when the leaflets are all attached to the end of the stalk.

3. SHAPE OR FORM OF THE BLADE. — The terms used to describe the shapes of leaves tell two things about the blade — how broad it is compared to its length, and where it is broadest. Of leaves that are broadest towards the base the most common shapes are the lanceolate (Fig. 48), and the ovate (Fig. 53); the former is several times, and the latter at most about twice, as long as broad. If the preceding shapes be reversed, end for end, the leaves are then broadest towards the apex, and are described accordingly as oblanceolate, and obovate (Fig. 83).

In the remaining shapes, the leaves are broadest about the middle, or at least do not have their greatest breadth towards the base or the apex. The following shapes are commonly met with, these being arranged in order of increasing width relative to the

length; needle-like (acicular) when extremely narrow, as in pines and tamarack; linear, long and narrow with the two edges mostly parallel, as in hemlock and balsam; oblong, about twice as long as broad with approximately parallel edges; elliptical; oval or broadly elliptical with the breadth at least half the length and a gradual taper to both ends, as Figs. 49, 75, 105.

Often it is necessary to combine two terms to express the shape.

A statement as to the shape of a leaf and its length necessarily indicates its approximate breadth. The length of leaves given in the text for any particular species has reference to the blade part only, and the figure is meant as a general average to be encountered.

4. MARGIN OF A LEAF. — If the edge of the blade be not toothed or indented in any way, the margin is said to be entire (Figs. 121, 123). The leaf is serrate if there are sharp teeth with one edge of the tooth longer than the other edge (Figs. 73, 175); and dentate if the two edges are about equal (Fig. 77). A margin with rounded instead of sharp teeth, having a somewhat scalloped appearance, is said to be crenate (Figs. 109, 134). In the case of leaves with 2 distinct sizes of teeth, as in elm leaves (Figs. 103, 105, 107), the margin is said to be double-toothed. Thus the margin could be double-serrate, double-dentate, or double-crenate.

When teeth exceed the common largest sizes, they are known as lobes, and the leaf described as a lobed one (Figs. 87, 117, 125).

5. VENATION OF A LEAF. — A leaf is pinnately veined if the main veins branch off along the two sides of a central midrib (Figs. 103, 130). In pinnately veined leaves with double-teeth, the main veins usually extend to the largest teeth. If any of these veins branch near the margin and serve two or more large teeth the leaf is said to have forked veins; therefore, forking of veins applies only to leaves that have double teeth. If the main veins radiate out from the end of the leaf-stalk through the blade of the leaf, the venation is palmate (Figs. 159, 163).

II. FLOWER

Trees produce flowers just as normally as our common garden flowering plants. As tree flowers are to be seen for but a few days, they are ordinarily not much used in identification, though in the last analysis the classification of trees rests on flower characters.

A typical flower consists of two outer sets of leaf-like structures known as the calyx (generally greenish), and the corolla (of a conspicuous colour in many plants but seldom so in trees); inside these are the stamens or pollen-bearing bodies, and in the centre the pistil or carpels which are the seed-producing members (Fig. 120).

The purpose of tree flowers is to give rise to seeds, which are very young trees surrounded by protective structures and thus suited to pass a portion of their infancy in a dormant condition. A seed is produced if grains of pollen from a stamen are blown by the wind or carried by insects to the pistil (carpel) and this followed by the union of certain elements in the two structures. The stamen cannot produce seeds, and the pistil can do so only with the help of the stamen. Thus the stamen and the pistil are the important parts of a flower, since they are responsible for the production of the seed which perpetuates the tree.

1. TYPES OF FLOWER. — In many trees, the flowers are of the kind described above — that is, each flower contains both stamens and pistils; these are called perfect

flowers since they can produce seed. But in the case of many other tree species, the flowers contain only stamens or only pistils, and not both together in the same flower. Such flowers are unisexual, and distinguished as staminate or as pistillate according as they contain stamens only or pistils only.

In some kinds of tree, the staminate and pistillate flowers are always on different specimens and never mixed on the same tree. Since only the pistillate flower can produce seed, the staminate trees never bear fruit. It is for this reason that particular Manitoba Maple trees, for instance, never show any seed.

Figs. 41 and 187 show staminate flowers, and Figs. 42 and 188 the corresponding pistillate flowers of the same species.

2. FLOWER CLUSTERS. — Flowers occur singly on the branches or in clusters. If the cluster consists of many individual flowers arranged along a central stem, each flower with its own stalk, it is called a raceme (Fig. 144). If such flowers all spring from the one point at the end of the stem, the cluster is an umbel (Fig. 171). A cluster like a raceme except that the flowers have no stalks is a spike. A spike, bearing unisexual flowers like a "pussy willow", is known as a catkin (Figs. 41, 67).

III. FRUIT

The fruit consists of the seed or seeds and the parts accompanying them.

In examining the fruits of hardwood trees, we take note of their shape, size, whether they split open to free the seeds or not, the number and character of seeds, and to what extent the outer covering is fleshy. Colour is helpful in many cases of identification, but this changes considerably while the fruit is maturing, especially in a fleshy one; the true colour of fruits is not seen until they are fully ripe.

All fruits will be arranged necessarily after the same manner as the flowers which gave rise to them, i.e., singly, or in racemes, or umbels, etc.

IV. WINTER TWIG

The term, twig, is used throughout this bulletin to include only that new portion at the end of each branch which was produced during the past growing season. The twigs taken from a large number of specimens of any one kind of tree are remarkably alike; in fact, they usually show a more limited range of variation than do the leaves from these same trees. Furthermore, twigs from the different kinds of tree are as a whole very unlike, showing differences in colour, taste, the markings on them, and particularly in the features of the winter buds present on them. These two circumstances make the twig a very useful and reliable means of identifying our trees, and enable us to tell them quite readily when the leaves are off. Strange as it may seem, trees are distinguished more easily in the winter than in the summer.

Our hardwood trees always begin to produce their leaves and flowers for the next season during the preceding summer. These leaves and flowers exist in miniature in the buds which we see on the twigs during the winter. The buds originate in a definite place on the twig, practically always in the angle between the stem and the stalk of the leaf. Hence buds and leaves have the same arrangement on the twig. A bud may contain leaves only, or flowers only, or both. They are enclosed by overlapping small structures, called bud-scales.

Buds are the most characteristic part of the twig for identification work. For this

purpose we make use of their arrangement on the twig, their colour, shape, size, number of their bud-scales, amount of hairiness, and other features. When choosing twigs for the purpose of identifying a tree, always select twigs sufficiently long to show at least 5 (preferably more) lateral buds.

The markings to be seen on all twigs are also of great help. When the leaves drop in the autumn, scars are left on the twig at their points of attachment. A leaf-scar has the same outline as the end of the leaf-stalk which has come away, and this is fairly uniform in any given species of tree. The leaf-scar always shows on its face various dot- or dash-like marks; these are where the veins of the leaf, gathered together in the stalk and running into the twig, have been broken off when the leaf fell; they are called bundle-scars. The number of bundle-scars to be seen in a leaf-scar and the arrangement of them are of considerable value in identifying twigs. The stipules accompanying a leaf must also leave their scars alongside the leaf-scar, but these are mostly inconspicuous.

Colour of twigs with many tree species is quite reliable, but in others shows a considerable range. In the vicinity of large cities, one can get no idea of the natural colour until the twig is washed.

Lastly, a twig shows minute dot- or line-like marks of a different colour irregularly over its surface. These are loosely plugged openings through the bark to permit air to reach the interior of the twig, and are known as lenticels. As the twig gets older and grows thicker, the lenticels may become stretched or elongated considerably, as for example in birch and cherry. The type of lenticel is useful in recognizing some trees.

V. BARK

The bark on all trees is smooth when they are small, and so is of only slight help in identifying them. But as the trunk increases in diameter, the bark splits and cracks in various ways, making more or less definite patterns. The resulting pattern is fairly uniform with the same kind of tree, but is not a thing which can be described to another person very satisfactorily. Barks, however, are reliable means of identification when one becomes familiar with them.

There are two general types — the fissured bark, with longitudinal furrows or clefts alternating with raised, more or less flattish ridges, the whole being relatively firm; and the scaly or flaky bark, with pieces detaching rather readily from the surface. In a few cases, the bark remains smooth throughout the life of the tree, as in beech.

Colour of bark is a rather variable feature.

The description of bark in the text has reference to mature trees.

HOW TO USE KEYS FOR IDENTIFICATION

In this bulletin there are three keys to guide the user in his identification of tree material — one for the Evergreens, and two for the Broad-leaved Trees to cover both the summer and winter conditions. Exotic trees are not included in the keys.

The principle of a key is that one has a choice between successive pairs of alternatives, each choice eliminating some trees, until finally the continuance leads to a single tree. In the leaf key to the Hardwoods, one is often brought only to the group, for example, the maples or the ashes, and the further separation is looked for in the descriptions supplied.

The two alternative choices carry the same number followed by the letters *a* and *b*; in addition these are set in from the left-hand margin of the page an equal distance. The first choice having been made, one proceeds to a choice between the next two alternatives underneath the first choice and slightly farther to the right, and ignores all alternatives under the discarded choice. This process is continued until the material is determined. One then turns to the page indicated and checks the result by the detailed description.

The method may be made clearer by reference to the key to broad-leaved trees in winter on page 21. First, one examines the twig to decide between *1a and 1b*, i.e., whether the leaf-scars are in pairs or not. Suppose they are not opposite. Everything under *1a* is ignored, one proceeds at once to *1b*, and chooses between *5a* and *5b*. If the twig be not encircled by a line-like scar at each leaf-scar, all under *5a* is neglected, and a choice is then made between *8a* and *8b*. If *8a* applies to the material the next choice is between *9a* and *9b*, and so on, until the choice ends in a certain tree. Then the full description of the twig of that tree is referred to in order to check the details of leaf-scar, bundle-scars, and buds.

In the keys provided, the initiated will notice a departure from customary usage. The keys were made with the inexperienced in mind. An attempt has been made to foresee the probable mistakes in the interpretation of material due to individual differences in powers of observation, and to achieve identification despite such mistakes. This necessitated placing some trees under alternatives which, strictly speaking, do not apply, but on the surface appear to do so.

KEY TO NATIVE EVERGREEN TREES

1a. Leaves scale-like, seldom more than ⅛ inch long, arranged in opposite pairs completely clothing the twig; occasionally some twigs present with longer leaves in 2's or 3's.
  2a. Leaf-covered twigs flattish; successive pair of leaves not alike in shape; fruit a cone ..... WHITE CEDAR, p. 34
  2b. Leaf-covered twigs 4-sided, fine, cord-like, successive pairs of leaves alike; fruit berry-like ..... RED CEDAR, p. 35

1b. Leaves needle-like or linear, not scale-like.
3a. Clustered leaves present, needle-like.
4a. All the leaves clustered, not more than 5 in a cluster.
5a. Clusters with 5 leaves in each ..... WHITE PINE, p. 25
5b. Clusters with fewer than 5 leaves in each.
6a. Leaves in 3-leaved clusters ..... PITCH PINE, p. 28
6b. Leaves in 2-leaved clusters.
7a. Leaves 5 or 6 inches long ..... RED PINE, p. 25
7b. Leaves about 1¼ inches long ..... JACK PINE, p. 25
4b. Leaves on short side branchlets in a cluster of more than 5; leaves on the end shoots singly placed ..... TAMARACK, p. 28

3b. All leaves singly placed, linear.
8a. Leaves flat.
9a. Branchlets roughened by woody bases of fallen leaves ..... HEMLOCK, p. 33
9b. Branchlets smooth, leaf-scars circular ..... BALSAM FIR, p. 33
8b. Leaves 4-sided, branchlets roughened.
10a. Twigs hairless; closed cone cylindrical, blunt; open cone with thin flexible, mostly entire scales ..... WHITE SPRUCE, p. 29
10b. Twigs densely short hairy; closed cone ovoid, pointed; open cone with stiff scales having more or less toothed margins.
11a. Leaves dark-green, dull; cone ¾ inch long, persistent on the tree many years ..... BLACK SPRUCE, p. 29
11b. Leaves yellow-green, shiny; cone 1¾ inches long, deciduous within a year after seed dispersal ..... RED SPRUCE, p. 29

KEY TO NATIVE BROAD-LEAVED TREES IN THE LEAFY CONDITION

1a. Leaves compound, i.e., the blade divided into separate parts or leaflets.
2a. Leaves arranged in pairs, opposite each other.
3a. Leaflets 5 to 7 mostly; twigs of medium thickness; tree mostly straggling ..... MANITOBA MAPLE, p. 89
3b. Leaflets rarely as few as 7; twigs stout; tree straight growing ..... ASH, p. 100
2b. Leaves arranged singly.
4a. Leaves, or some of them, twice compound.
5a. Leaves about 6 inches long; twigs not over ¼ inch thick; branches thorny ..... HONEY LOCUST, p. 82
5b. Leaves up to 3 feet in length; twigs ½ inch thick; branches not thorny ..... COFFEE-TREE, p. 85
4b. Leaves once compound.
6a. Leaflets not exceeding 9 in number.
7a. Leaflets 3 in number ..... HOP-TREE, p. 87
7b. Leaflets more than 3 in number ..... HICKORY, p. 46
6b. Leaflets exceeding 9 in number.
8a. Margin of leaflets without teeth, or practically so.
9a. Leaflets lanceolate, seldom ½ inch broad; branches with long thorns ..... HONEY LOCUST, p. 82
9b. Leaflets oblong, averaging ¾ inch broad; branches at times prickly ..... BLACK LOCUST, p. 86
8b. Margin of leaflets plainly toothed.
10a. Pith of twig cut lengthwise showing cavities.

11a. Leaf and stalk densely downy; upper edge of leaf-scar not notched, and bordered with a hairy ridge ..... BUTTERNUT, p. 43
11b. Leaf and stalk almost hairless; upper edge of leaf-scar notched, and not bordered with a hairy ridge ..... WALNUT, p. 43
10b. Pith of twig solid, not showing cavities.
12a. Twigs conspicuously velvety hairy ..... STAGHORN SUMACH, p. 88
12b. Twigs clean, not velvety hairy ..... MOUNTAIN ASH, p. 81

1b. Leaves simple, the blade not divided into separate leaflets.
13a. Leaves arranged in pairs, opposite each other.
14a. Leaves 3- to 5-lobed ..... MAPLE, p. 89
14b. Leaves not lobed.
15a. Margin of leaf sharply toothed ..... NANNYBERRY, p. 104
15b. Margin of leaf not toothed ..... FLOWERING DOGWOOD, p. 98
13b. Leaves arranged singly.
16a. Leaves distinctly lobed.
17a. Margin of leaf, or lobes, without teeth.
18a. Leaf looking as if the end had been cut off; usually 4-lobed ..... TULIP-TREE, p. 70
18b. Leaf not looking as it the end had been cut off; 2- or 3-lobed ..... SASSAFRAS, p. 73
17b. Margin of leaf, or lobes, with teeth.
19a. Unlobed leaves present on the same tree.
20a. Unlobed leaves roundish heart-shaped; fruit recalling a thimble-berry ..... RED MULBERRY, p. 68
20b. Unlobed leaves triangular-ovate; fruit a crab apple ..... WILD CRAB, p. 80
19b. No unlobed leaves on the same tree.
21a. Leaves recalling those of maple trees ..... SYCAMORE, p. 74
21b. Leaves not maple-like; fruit an acorn in a cup ..... BLACK and WHITE OAKS, p. 56

16b. Leaves not lobed.
22a. Margin of leaf without teeth.
23a. Leaves about as broad as long, heart-shaped ..... RED-BUD, p. 85
23b. Leaves plainly longer than broad.
24a. Leaves less than 5 inches long; fruit a small berry.
25a. Lobed leaves present on the same tree; bruised leaves and twigs spicy aromatic ..... SASSAFRAS, p. 73
25b. No lobed leaves present.
26a. Venation irregular indistinct pinnate; twig cut lengthwise showing cross partitions in the pith ..... BLACK GUM, p. 100
26b. Veins arching upwards towards the tip; twig cut lengthwise not showing partitions in the pith; always a small tree ..... ALTERNATE-LEAVED DOGWOOD, p. 98
24b. Leaves averaging much more than 5 inches in length.
27a. Leaf narrowed to a wedge-shaped base ..... PAPAW, p. 70
27b. Leaf full and rounded at the base ..... CUCUMBER-TREE, p. 69
22b. Margin of leaf serrate or toothed.
28a. Margin of leaf doubly serrate or toothed.
29a. Base of majority of leaves strongly oblique on one side, asymmetrical.
30a. Margin of leaf sharply doubly serrate, veins close together, 4 to 6 per inch of midrib ..... ELM, p. 64
30b. Margin of leaf large wavy toothed, veins widely spaced, 1 or 2 per inch of midrib ..... WITCH-HAZEL, p. 73
29b. Base of majority of leaves essentially symmetrical.
31a. Tips of the larger or main teeth prominent.
32a. Leaf oval, lower surface hoary ..... GRAY ALDER, p. 53
32b. Leaf triangular ovate, lower surface practically hairless.
33a. Leaf narrowed suddenly into a long slender point, veins minutely glandular ..... GRAY BIRCH, p. 48
33b. Leaf gradually tapering to a sharp point, veins clean ..... WILD CRAB, p. 80

31b. Tips of the larger or main teeth scarcely more prominent than the intervening teeth.

34a. Teeth blunt (crenate) ..... CANADA PLUM, p. 76

34b. Teeth sharp (serrate).

35a. Leaves singly placed, but appearing to be in pairs on the dwarf twigs which are numerous; bark of younger trunks and older limbs with conspicuous elongated lenticels ..... BIRCH, p. 48

35b. Leaves all singly placed and not appearing in pairs bark not showing conspicuous elongated lenticles.

36a. Leaf with full rounded base and no forking veins; trunk ridged; bark smooth ..... BLUE BEECH, p. 53

36b. Leaf narrowed at the base, forked veins common; trunk not ridged; bark scaly ..... HORNBEAM, p. 52

28b. Margin of leaf singly serrate or toothed.

37a. Toothing mostly coarse, on the average the tips of 6 teeth at most occurring within 1 inch of margin.

38a. Leaf narrowed rapidly towards the base on both sides of midrib, giving a distinctly pointed base.

39a. Teeth mostly blunt-pointed; fruit an acorn ..... CHESTNUT OAK GROUP, p. 63

39b. Teeth sharp.

40a. Leaf around 4 inches long; husk of fruit 4-parted, about ¾ inch long; bark smooth ..... BEECH, p. 55

40b. Leaf usually 6 to 8 inches long; husk of fruit globular, spiny, about 2 inches in diameter ..... CHESTNUT, p. 56

38b. Base of leaf broad, not distinctly narrowed to a point.

41a. Teeth sharp.

42a. Leaf about 3½ inches long, ovate-triangular; tree thorny ..... WILD CRAB, p. 80

42b. Leaf about 5 inches long, roundish heart-shaped; tree not thorny ..... BASSWOOD, p. 96

41b. Teeth rounded.

43a. Leaf-stalks flattened ..... POPLAR, p. 41

43b. Leaf-stalks not flattened, roundish in cross section.

44a. Toothing regular and uniform; leaf symmetirical at the base; twig juicy milky ..... RED MULBERRY, p. 68

44b. Leaf irregularly wavy-toothed, not symmetrical at base ..... WITCH-HAZEL, p. 73

37b. Toothing fine, on the average the tips of more than 6 teeth, and generally at least 9, occurring within 1 inch of margin.

45a. Leaf-stalks flattened ..... POPLAR, p. 41

45b. Leaf-stalks not flattened, roundish in cross section.

46a. Base of leaf not symmetrical, distinctly oblique on one side; pith of twig cut lengthwise showing cavities .... HACKBERRY, p. 67

46b. Base of leaf essentially symmetrical; pith of twig solid.

47a. Leaves generally narrow, several times as long as broad; bud with but 1 bud-scale ..... WILLOW, p. 38

47b. Leaves broad, generally not three times as long as broad; bud with more than one bud-scale.

48a. Leaf-stalk short, averaging ¼ or less the length of the blade; fruit fleshy, cherry- or plum-like.

49a. Leaf narrowed gradually to the base; younger bark with conspicuous lenticles; twigs with a strong taste of bitter almonds ..... CHERRY and PLUM, p. 76

49b. Leaf full rounded to heart-shaped at base; bark not showing conspicuous lenticles; JUNE-BERRY, p. 80

48b. Leaf-stalk ½ the length of the blade or longer; fruit dry not fleshy.

50a. Teeth on leaf inconspicuous, rounded ..... POPLAR, p. 41

50b. Teeth on leaf conspicuous, sharp ..... BIRCH, p. 48

KEY TO NATIVE BROAD-LEAVED TREES IN THE LEAFLESS CONDITION

(The term *twig* refers only to the most recent growth at the ends of the branches.)

1a. Leaf-scars regularly occurring in pairs, opposite each other.
  2a. Bundle-scars numerous, in a curved line; leaf-scars conspicuous; twigs coarse ..... ASH, p. 102
  2b. Bundle-scars 3 in number, or in 3 groups.
    3a. Terminal bud about ¾ inch long and mealy-looking, leaf-bud very slender and pointed, flower-bud similar but bulbous at the base; fruit berry-like, dark bluish ..... NANNYBERRY, p. 104
    3b. Terminal bud typically not exceeding ½ inch, and when this length not mealy-looking.
      4a. Lateral buds minute, nearly hidden by bases of leaf-stalks after leaf-fall; conspicuous, globular, terminal flower-buds usually abundant; fruit berry-like, reddish ..... FLOWERING DOGWOOD, p. 99
      4b. Lateral buds fully exposed and not at all covered up by leaf-stalks; fruit not berry-like, but dry and winged ..... MAPLE, p. 90

1b. Leaf-scars regularly not in pairs, but one at a node.
  5a. Twig ringed by 1 line-like (stipule-)scar which encircles the stem at each leaf-scar (Fig. 222)
    6a. Bud densely silky hairy ..... CUCUMBER-TREE, p. 69
    6b. Bud smooth without hairs.
      7a. Bud conical, covered with one cap-like scale ..... SYCAMORE, p. 76
      7b. Bud not conical, more or less flattened, covered with two scales face to face ..... TULIP-TREE, p. 70
  5b. Twig not encircled by line-like (stipule-)scars.
    8a. When twig cut centrally lengthwise, pith shows cavities alternating with partitions (Fig. 255), or else a continuous pith barred across at intervals with hard partitions of a different colour (Fig. 254).
      9a. Pith showing cavities.
        10a. Twigs coarse; leaf-scars large and conspicuous; bundle-scars conspicuous in 3 clusters.
          11a. Upper edge of leaf-scar not notched, and bordered with a densely hairy ridge ..... BUTTERNUT, p. 46
          11b. Upper edge of leaf-scar notched, and without a densely hairy ridge ..... WALNUT, p. 46
        10b. Twigs fine; leaf-scars small; bundle-scars inconspicuous, 1 or 3 ..... HACKBERRY, p. 68
      9b. Pith not showing cavities, continuous but barred across.
        12a. Buds densely glistening brownish hairy all over ..... PAPAW, p. 73
        12b. Buds not densely brownish hairy all over ..... BLACK GUM, p. 100

    8b. Pith of twig in lengthwise section neither chambered nor barred, but of the usual uniform type.
      13a. Leaf-scars as a rule arranged in 2 rows lengthwise along the twig (i.e., if each scar be joined by a line to the next one directly above it).
        14a. Bundle-scars typically 3 in number; occasionally one or more of these may be subdivided and so replaced by a small group.
          15a. Buds plainly stalked, showing at most 2 scales and these not overlapping up the bud.
            16a. Buds and twigs reddish; buds with 2 scales face to face; catkins and woody cone-like fruits usually on the tree; pith triangular ..... ALDER, p. 53
            16b. Buds and twigs yellowish-gray; no true bud-scales; remains of autumn flowers and woody fruits split into four, usually on the tree ..... WITCH-HAZEL, p. 74
          15b. Buds not stalked, showing for the most part more than 2 scales and these overlapping.
            17a. More than 1 bud often present above some of the leaf-scars; buds mostly blunt and flattened, often clustered below the bases of branches; fruit a flat bean-like pod ..... RED-BUD, p. 85

17b. Only 1 bud regularly above each leaf-scar.
18a. Leaf-buds of two kinds, those terminating dwarf twigs show 5 to 7 bud-scales and lateral buds on normal twigs show 3 bud-scales; fruit catkin-like ..... BIRCH, p. 50
18b. Leaf-buds all of one kind; fruit not catkin-like.
19a. Usually 2 bud-scales visible, at times 2; bud stout, ovoid generally somewhat flattened, not placed squarely above the leaf-scar; twigs not fine ..... BASSWOOD, p. 96
19b. Four or more bud-scales visible (numerous, except in Juneberry).
20a. Bud-scales definitely arranged in 2 overlapping rows; bundle-scars usually sunken ..... ELM, p. 65
20b. Bud-scales not clearly arranged in 2 rows only.
21a. End bud not more than ¼ inch long, ovoid, with numerous scales, mostly arranged in 4 rows.
22a. Lateral buds appressed, slender, mostly narrower than the twig diameter; bud-scales whitish fringed; bark of trunk smooth, with ridges and hollows; winter catkins never present ..... BLUE BEECH, p. 53
22b. Lateral buds divergent, plump, wider than twig diameter; bud-scales without a fringe; bark of trunk scaly; winter catkins occur ... HORNBEAM, p.52
21b. End bud over ¼ inch in length, slender, long-pointed conical, about 5 scales visible; pith star-shaped or 5-angled ..... JUNE-BERRY, p. 80

14b. Bundle-scars typically more than 3 in number and scattered.
23a. Buds densely glistening brownish hairy all over ..... PAPAW, p. 73
23b. Buds smooth, or with a few hairs.
24a. Buds at least 4 or 5 times as long as broad, sharply pointed ..... BEECH, p. 55
24b. Buds not much longer than broad.
25a. Pith of twig roundish, when cut across.
26a. Buds large, not placed squarely above leaf-scar, 2 or 3 scales visible; fruit woody pea-like bodies attached to a narrow leaf-like affair ..... BASSWOOD, p. 96
26b. Buds small, more than 3 scales visible; fruit recalling a thimble-berry ..... RED MULBERRY, p. 68
25b. Pith of twig more or less star-shaped in cross section; fruit a spiny, bur-like body ..... CHESTNUT, p. 56

13b. Leaf-scars are a rule in more than 2 row along the twig.
27a. Some buds partially or completely hidden (sunken in the bark); typically more than 1 bud at each leaf-scar along the twig.
28a. Twigs very stout, about ½ inch in diameter, pith very large ..... COFFEE-TREE, p. 85
28b. Twigs not stout, usually less than ¼ inch thick.
29a. No buds visible till towards spring; buds 3 in a cluster buried beneath leaf-scar; often 2 prickles at the leaf-scar ... BLACK LOCUST, p. 86
29b. Some of the buds at least visible after leaf fall.
30a. Buds not hairy, about 5 at each leaf-scar with only uppermost visible; tree with thorns; fruit a long, twisted, reddish pod ..... HONEY LOCUST, p. 82
30b. Buds densely hairy all over.
31a. Buds white woolly; fruit like that of elm; HOP-TREE, p. 87
31b. Buds glistening brownish hairy ..... PAPAW, p. 73
27b. All buds exposed, none partially hidden; mostly arranged singly along sides of twig.
32a. Twigs characterized by having slender lateral branchlets which are longer than the main twig.
33a. Twigs pleasantly spicy and strongly aromatic when chewed; bundle-scars 1 ..... SASSAFRAS, p. 73

33b. Twigs bitter to the taste, with rather disagreeable odour; bundle-scars 3 ..... ALTERNATE-LEAVED DOGWOOD, p. 99

32b. Twigs not characterized by the presence of slender lateral branchlets exceeding the main twig.

34a. Buds along twig densely covered with hairs, small, mostly hemispherical to globular, not plainly covered with overlapping scales.

35a. Buds glistening brownish hairy ..... PAPAW, p. 73

35b. Buds whitish to yellowish hairy.

36a. Twigs coarse and densely velvety hairy ..... STAGHORN SUMACH, p. 88

36b. Twigs fine and not densely velvety hairy HOP-TREE, p. 87

34b. Buds along twig not densely hairy; or, if so, plainly scaly.

37a. Buds at the end of the twig forming a cluster.

38a. Bundle-scars 3 in number ..... CHERRY, p. 78

38b. Bundle-scars more than 3.

39a. Bud-scales numerous; fruit an acorn with a cup ..... OAK, p. 61

39b. Bud-scales 2 or 3 visible; fruit a spiny bur-like body ..... CHESTNUT, p. 56

37b. Buds not typically clustered at the end of the twig; or, if somewhat this appearance, one bud much larger than the others.

40a. Bundle-scars several, at least more than 3.

41a. End bud at least ⅜ inch long; pith roundish in cross section.

42a. Bundle-scars numerous, scattered or grouped; twigs tough, difficult to break off; fruit a nut in a husk ..... HICKORY, p. 49

42b. Bundle-scars 5; twigs easily broken off; fruit berry-like ..... MOUNTAIN ASH, p. 81

41b. End bud less than ⅜ inch long; pith star-shaped ..... CHESTNUT, p. 56

40b. Bundle-scars 3 in number.

43a. Buds with 1 or 2 scales.

44a. Bud with 1 scale wrapped around WILLOW, p. 39

44b. Buds with 2 scales face to face; pith triangular in cross section ..... ALDER, p. 53

43b. Buds with more than 2 scales.

45a. Lowermost scale of lateral bud directly above leaf-scar, facing outwards ..... POPLAR, p. 42

45b. Lowermost scale of lateral bud not directly above leaf-scar.

46a. Tree armed with thorns.

47a. Bud grayish-brown, bark mostly smooth, black, with conspicuous elongated lenticels; fruit a plum ..... CANADA PLUM, p. 78

47b. Bud reddish; bark reddish-brown, scaly; fruit a crab-apple ..... WILD CRAB, p. 81

46b. Tree not armed with thorns.

48a. End bud at least ⅜ inch long; fruit with several seeds, berry-like ..... JUNE-BERRY, p. 80

48b. End bud less than ⅜ inch long; fruit with 1 seed, a cherry ..... CHERRY, p. 78

THE EVERGREEN TREES

The trees described in this bulletin can be classified naturally into two great groups — one which includes those trees the seeds of which are naked or exposed, and a second group in which the seeds are contained in a case (ovary).

In most of the trees which belong to the first group, the leaves are extremely narrow compared to their length and live two seasons or more; the fruit is a cone and the lumber is soft and resinous. Accordingly, they are known as the Needle-leaved Trees, Evergreens, Coniferous Trees or Conifers or Cone Trees, and Soft-woods. In this group, however, one meets with trees showing exceptions to each of the above-mentioned features.

In contrast to the Evergreens, the second group constitutes the Broad-leaved Trees, Deciduous Trees, or Hardwoods.

The forests of Ontario except in the south are largely made up of coniferous trees, since broad-leaved trees in general are less characteristic of north temperate regions, and occur on the more fertile soils. This is fortunate, for in conifers, the heavy stand of timber per acre, the tree habit of producing a single main trunk rather than a mass of branches, and the qualities of the wood make them of much higher economic importance to mankind than are the hardwoods. As in all Canada, it is our softwood forest which is responsible for the great development of the sawmill and pulpmill industries of the province.

Almost two-thirds of the primary growing stock on the productive forest land in Ontario is coniferous, with spruces, pines, and balsam fir forming nearly 90 per cent of the wood volume. Of this, black spruce forms almost one-half, jack pine one-quarter, with the remainder shared about equally by white spruce, and balsam fir. From these quantities, the importance of black spruce in Ontario's forests is apparent.

These valuable softwood forests include only 12 coniferous tree species; this contrasts strongly with the much larger number of broad-leaved species. There are 4 pines, 3 spruces, and one species each of tamarack, hemlock, balsam fir, cedar, and juniper. These are easily separated by their leaf and fruit characters.

THE PINE FAMILY
PINACEAE

This is the largest and most important family of the conifers. In Ontario, it includes 5 genera: *Pinus, Larix, Picea, Tsuga, and Abies.*

The leaves of all are spirally arranged, needle-like or linear, and persistent (except Larix which sheds its leaves annually).

The flowers of all are monoecious, that is, both male and female flowers occur on the same tree.

The cone-scales are spirally arranged; each scale bearing 2 seeds on its upper face, each of these with a long wing at its upper end.

THE PINES
PINUS

The pines are important lumber and pulpwood trees. The leaves of all the Ontario pines are needle-like and in clusters of 2, 3, or 5, and since the number in a cluster is

remarkably constant for the species and foliage is present the year round, this affords ready identification.

The flowers of pines (and their allies — spruce, tamarack, hemlock and balsam fir) are unisexual, with both staminate and pistillate on the one tree. The flowers are minute bodies, a pair of them related to a scale. A large number of these scales are arranged in a spiral manner on a central axis, so that pine flowers, whether staminate (Fig. 4) or pistillate (Fig. 5), are to be seen in the early summer in cone-shaped clusters. The pistillate flowers after fertilization develop slowly into the well-known pine cones. Since this requires two seasons, one may find on a pine tree in the autumn both 1-year (Fig. 6) and 2-year cones. In the other coniferous trees, except Juniper, only one season is required for maturity.

The cone of the pines (and of tamarack, spruce, hemlock and balsam fir) consists of a number of woody scales spirally arranged on a central axis. On the upper face of each scale lie two seeds, each with a long wing at the upper end (Fig. 7).

White Pine *Pinus strobus L.*

White Pine, commonly called Weymouth Pine in Europe, is our largest evergreen, reaching diameters of 5 feet and heights of 150 feet, and distributed throughout the province south of the Height of Land, in places over large areas to the practical exclusion of other species. It was a characteristic species in Old Ontario's forests.

White Pine long furnished the best known lumber on this continent. For many years, it led in the quantity cut among the saw-timber species of Canada, but to-day White Pine forms a relatively small proportion of the conifer wood volume in the province.

White Pine leaves are about 4 inches long, with 5 leaves in a cluster (Fig. 2). They are quite slender, flexible and soft to feel in the hand, and dark blue-green in colour; each cluster is surrounded at the base with a sheath that falls off early.

The cone (Figs. 1, 3) is cylindrical in shape, averaging when closed about 5 inches long by 1 inch across, with a stalk of ¾ inch. The cone-scales are thin, not thickened at the tips and without prickles. The cones open early in September, and at once the seeds are disseminated, and the cones drop off later.

Red Pine *Pinus resinosa Ait.*

Red Pine derives its name from the colour of its bark. It is also known as Norway Pine. While a large tree it does not reach as great a height nor as large a diameter as White Pine. Its distribution in the province corresponds with that of White Pine but extends somewhat farther north. It is, however, of less common occurrence than White Pine.

The wood of Red Pine is very similar to that of White Pine except that it is somewhat heavier and harder. The lumber is used as White Pine.

Red Pine leaves are 5 or 6 inches long, with 2 in a cluster (Fig. 8). They are somewhat flexible and dark green in colour with each cluster surrounded at the base by a persistent sheath.

The closed cone is ovoid in shape and about 2 inches long (Fig. 9). It opens when ripe to discharge most of its seeds but remains on the tree over winter. The cone-scales are slightly thickened at the tips and without prickles (Fig. 10).

Jack Pine *Pinus banksiana Lamb.*

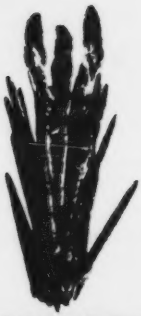
Jack Pine is a medium-sized tree, found farther north than any of our other species of pine, extending from the Muskoka region to north of the Transcontinental Railway.

1. Closed Cone.

2. Cluster of Leaves.

3. Opened Cone.

4. Staminate Flowers.



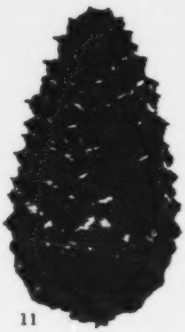
5. Pistillate Flowers.

6. One-year-old Cone.

7 Seeds.

WHITE PINE—(All figures natural size).

8, 9, 10. Red Pine.



11, 12, 13. Pitch Pine.

14, 15, 16. Jack Pine.

(All figures natural size).

It is noticeable throughout the northern forest as the tree so frequently reclothing burned-over areas. On good soils it reaches 70 to 80 feet in height and 16 or more inches in diameter. It is an important pulpwood and lumber species. The lumber resembles that of Red Pine very much, but is harder, heavier and more knotty.

Jack Pine leaves are thick, about 1¼ inches long, with 2 (occasionally 3) in a cluster, the pair surrounded at the base by a persistent sheath and the two spreading widely apart from each other (Fig. 15).

The cones are conical, about 1¾ inches long, usually curved (Fig. 14). They may open when ripe and discharge their seeds (Fig. 16), but more usually the tightly fitting smooth scales remain closed for a long period, often many years. In either event the cone persists on the tree for many years usually. Thus, there is almost always a supply of seed present with Jack Pine, and this in part explains its prevalence on burned-over areas.

Pitch Pine *Pinus rigida Mill.*

Pitch Pine is a small tree, seldom reaching a height of 60 feet. It occurs sparingly along the banks of the St. Lawrence River in the vicinity of Brockville and northward to approximately Charlotte Lake and on the Thousand Islands. Pitch Pine resembles Jack Pine in general appearance but is often a scrubby looking tree and is of little commercial importance.

This species is recognized at once by the presence of 3 leaves in each cluster. Clusters are enclosed at the base by persistent sheaths as in the case of Jack Pine and Red Pine; but in length the leaves are about midway between these two species, being about 3½ inches long (Fig. 13). They are light green in colour, fairly stout and somewhat rigid.

The cone is ovoid, around 2 inches long, somewhat resembling the cone of Red Pine, but more sharply pointed. In addition, each scale end is provided with a stiff prickle, in this differing from the cones of our other pines. At maturity, the cones open during the late fall and early winter to release their seeds but may remain on the tree for years. (Figs. 11, 12).

Outside our native pines the most commonly planted species are the Scotch Pine and Austrian Pine from Europe.

The SCOTCH PINE or SCOTCH FIR *(P. sylvestris L.)* has quite bluish-green leaves about 2 inches long, 2 in a cluster and twisted (Fig. 19). The cone (Figs. 17, 18) is usually grayish-brown in colour, sharply conic, about 2 inches long, and the scale ends are raised up more or less into projections. The cones generally point backward on the branch. The bark of the upper part of the trunk is red and peels off in thin ragged patches. This tree has been planted in considerable numbers because of its hardiness and rapid growth. It is not recommended for timber production but is satisfactory as a Christmas tree.

The AUSTRIAN PINE *(P. nigra Arnold)* is noticeable for the darkness of the green foliage and its density. The leaves recall those of our native Red Pine, being about the same length with 2 in a cluster, but are thicker, more rigid and very sharp with needle-like points. The cone is usually larger than that of the Red Pine, but varies from 2 to 3½ inches. It has a very glossy appearance and the ends of the scales are more swollen and elevated than in the Red Pine. Several varieties of Austrian Pine are known.

In addition to the above, the SWISS MOUNTAIN PINE is planted as an ornamental, usually in its dwarf form under the name of MUGHO PINE *(P. mugo Turra var. mughus Zenari)*. It is a bushy, shrub-like pine with leaves about 2 inches long, 2 in a cluster.

The SWISS STONE PINE *(P. cembra L.)* is another hardy species, but of very slow growth, which is similarly used. It has 5 leaves in a cluster and branchlets densely coated with light-brown, woolly hairs.

Tamarack *Larix laricina (Du Roi) K. Koch*

This tree, also known as Hackmatack and Larch, occurs throughout the province and accompanies the spruces to the limit of tree growth. It is a tree of the cold swamps, producing a hard, strong, durable wood suitable for ties, posts, poles, and structural timbers. It is, however, very largely exhausted.

The leaves are needle-like, about 1 inch long, and arranged in two ways (Fig. 22). On the twigs that elongate they are placed singly in a spiral manner; on the dwarf twigs that form spur-like lateral branchlets they are in clusters as in the pines, but with a much larger number in a cluster. The foliage drops every autumn as with the broad-leaved trees.

The flowers are similar to those of the pines.

The cone matures in one season and is of the pine type. It is about ½ inch long on a stout curved stalk, and usually persists for a year after the seeds are shed (Figs. 23, 24).

In the winter, the tamarack may be told readily by the presence of cones and of innumerable short, stubby, spur-like, lateral branches. The bark is scaly similar to that of spruces, but distinguished from them by the reddish purple colour of the inner bark.

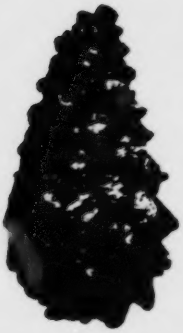
The EUROPEAN LARCH *(L. decidua Mill.) (syn. L. europaea DC.)* is cultivated frequently. Its leaves are longer and more numerous in the cluster than in our native Tamarack; the twigs are yellower and much stouter; and the cones average at least 1 inch in length (Figs. 20, 21, 22).

THE SPRUCES
PICEA

White Spruce *Picea glauca (Moench) Voss*
Red Spruce *Picea rubens Sarg.*
Black Spruce *Picea mariana (Mill.) B.S.P.*

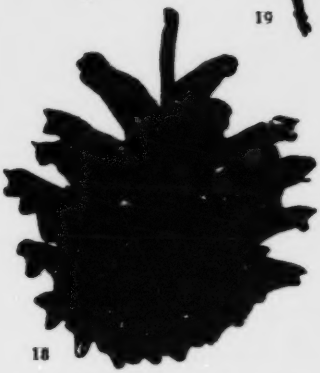
Spruces are medium-sized, scaly-barked trees, characteristic of the more northern forest and of great commercial importance. As saw-timber, they are less valuable than the pines of the province, but they are the most valuable species to the great pulp and paper industry.

White Spruce is occasionally known as Cat Spruce, and Black Spruce is sometimes called Swamp Spruce. These species are found in all parts of the province, extending



17

19



18

17, 18, 19. Scotch Pine.

20

21

22

20, 21, 22. European Larch.

23

24

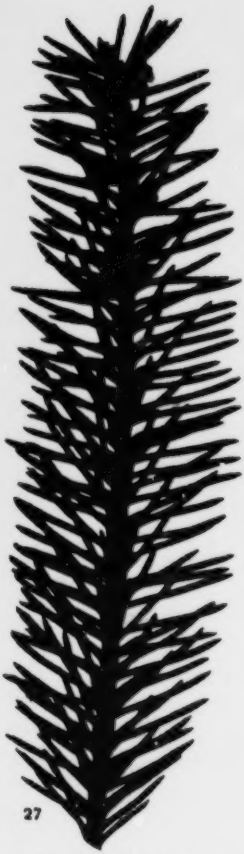
23, 24. Tamarack.

25

26

25, 26. Black Spruce.

(All figures natural size).



27

28

29

30

30 a

27, 28, 29. White Spruce.

30, 30 a. Red Spruce.

31

32

33

31, 32, 33. Hemlock.
(All figures natural size).

to Hudson Bay, but the range of Red Spruce in Ontario is imperfectly known; it occurs in Haliburton County and has been reported in the eastern part of the province. White Spruce and Red Spruce seldom exceed 75 feet in height and 2 feet in diameter, while Black Spruce averages smaller.

The leaves of spruce (Fig. 27) are linear to nearly needle-like, and vary from ¼ to ¾ inch in length according to the portion of the crown from which taken. They are arranged spirally on the branchlet, standing out from all sides, or with those on the lower side twisted upwards. Spruce leaves are 4-sided (our native species), and so can be rolled back and forth between the thumb and forefinger like a match. They also have small, woody bases which remain behind when the leaves fall off and leave the twig roughly studded with projections. This condition is also found in Hemlock, but its leaves are flat. The Balsam Fir leaf is also flat, but the twigs are smooth so that, Spruce, Hemlock and Balsam Fir are distinguished easily.

White Spruce leaves are bluish-green, glaucous, averaging ½ to ¾ inch in length, somewhat longer than the leaves of either Red Spruce or Black Spruce. When bruised, they have a disagreeable, cat-like odour usually. The twigs are hairless as a rule and light yellowish-gray in colour. Red Spruce leaves are yellowish-green in colour and shiny as if varnished. The twigs are light reddish-brown. Both Red Spruce and Black Spruce twigs are covered with dense, short, rusty hairs, but the Black Spruce has the shortest leaves, usually, seldom over ½ inch in length. They are dark blue-green and dull, and the twigs are dark brownish. With only foliage available, the separation of the spruce is not always certain. But the cones afford an easy means of identification and are generally always to be found, either on the tree or beneath it.

The flowers of spruce are organized after the manner of those of pine.

The cone and seed likewise are after the pine pattern, but mature in one season.

The cone of White Spruce is about 1¾ inches long, narrowly cylindrical in shape and blunt at the end when closed. The margins of the scales are practically entire; and on pressing an open cone between the fingers the whole compresses readily, as the scales are flexible. After discharge of the seeds the cones fall from the tree during the autumn and winter(Figs 28, 29).

The cones of Black Spruce and Red Spruce differ from those of the White Spruce in being ovoid in shape and pointed when closed, and when open, in having very stiff, rigid scales with finely toothed margins.

The cone of Red Spruce is somewhat shorter than that of White Spruce; the toothing on the scale ends is often indistinct, usually little more than a roughness. Matured cones may persist on the tree into the following summer (Figs. 30, 30a).

The Black Spruce cone is almost globular when open, seldom exceeding 1 inch in length when closed, and has a short, strongly curved stalk. Open cones persist on the tree for many years after the seed has been shed, filling the whole interior of the top of the crown (Figs. 25, 26).

The cones of spruces, in general, are produced only in the upper part of the tree.

The freshly cut inner bark of White Spruce is silvery white in colour, whereas that of Black Spruce and Red Spruce is olive-green.

Two foreign spruces are exensively planted in Ontario; the NORWAY SPRUCE and the COLORADO SPRUCE.

The NORWAY SPRUCE *(P. abies (L.) Karst.) (syn. P. excelsa Link)* of Europe has been planted very generally for ornament and for windbreaks and sparingly on cutovers in forestry practice. It is told readily by the large size of its cones, which are 4 to 6 inches long. There are innumerable horticultural forms in use.

The COLORADO SPRUCE *(P. pungens Engelm.) (syn. P. parryana Sarg.)*, from the southern Rockies, is much favoured for its decorative value. The foliage stands out almost at right angles to the branch, is quite rigid and sharp-pointed, and varies in colour from bluish-green to silvery-white according to the individual tree. The cone is 2½ to 4 inches long with wrinkled scales. Since the main attractiveness lies in the striking colour of the new growth at the ends of the branches, those nursery varieties with silvery or steely-blue leaves are most popular, usually the BLUE COLORADO SPRUCE *(var. glauca)* and KOSTER'S SPRUCE *(var. kosteriana)*.

Hemlock *Tsuga canadensis (L.) Carr.*

The Hemlock, found throughout Ontario south of the Height of Land, is our most graceful evergreen. With its crown made up of slender, flexible branches that curve downwards towards the ends, and a flexible arching leader, it is unlike any of our other conifers. It reaches heights of 60 to 70 feet with a trunk 2 to 4 feet in diameter.

Hemlock lumber has many unfavourable qualities, but its cheapness makes it useful as coarse lumber and rough dimension stock.

Hemlock leaves are linear, flat, singly placed, average ½ inch in length, and have a stalk (Fig. 32). Despite the spiral arrangement they are twisted to give a flat spray with the leaves apparently in two rows, as in Balsam Fir. But unlike Balsam Fir, the leaves have woody bases which persist after leaf-fall (Fig. 31) and make the twig rough as in Spruce. In Spruce, however, the leaves are not flat, but 4-sided.

The flowers of Hemlock are of the pine type.

Hemlock cones mature in one season, discharge their seeds slowly, and have all fallen by spring. The cone, when closed, is ovoid and about ¾ inch long (Figs. 31, 33).

The bark is deeply furrowed into rather broad ridges and shows purplish streaks when cut.

Balsam Fir *Abies balsamea (L.) Mill.*

This species is also called Fir and Balsam. It is a common tree in most parts of the province. Its wood is of inferior value for lumber, but is important in the making of pulp and paper. It is a small to medium-sized tree, on the average somewhat smaller than White Spruce with which it commonly associates.

The leaves (Fig. 34) are linear, flat, about 1 inch long, and spirally arranged. They do not have the woody bases which are present with Spruce and Hemlock leaves, and so Balsam Fir branchlets are not rough after the leaves have come away. Instead, they show only circular leaf-scars. Although the leaves originate all around the twig, they are generally twisted so as to appear as if in 2 rows, giving the spray a flattish appearance. In the top of the crown, the leaves are shorter, thicker, and erectly crowded. Much of the branching in Balsam Fir is opposite.

The flowers are of the pine type.

The cones (Fig. 35) are oblong, about 2½ inches long by 1 inch wide and mature in one season. They are unlike those of other conifers in two features. They always stand erect on the branch, never hanging down. At maturity, the cone does not open as in most evergreens, but the scales with their seeds fall away from the central stalk, which persists for a long time afterwards on the branch.

Balsam Fir bark is very characteristic, being smooth except at the base of very old trees. The bark shows prominent, blister-like bulges, which on being punctured exude resin or balsam.

Of foreign species of Abies, the most satisfactory for cultivation is the WHITE or SILVER FIR *(A. concolor (Gord. & Glend.) Lindl.)* from the southwestern region of United States. It is easily told from our native fir by the longer leaves (2 to 3 inches) with a tendency to curve upwards, and the grayish- to bluish-green colour instead of a dark green; and with its larger cones (3 to 5 inches).

THE CEDAR FAMILY
CUPRESSACEAE

This family is represented in Ontario by two genera: *Thuja* and *Juniperus.*

The leaves of the species of both are persistent, scale-like, or awl-shaped. The scale-like leaves are in pairs opposite each other. The awl-shaped leaves occur only in Juniperus and are often in 3's.

The flowers are monoecious except in Juniperus.

The cone-scales are few in number, opposite; seeds with 2 lateral wings, or wingless.

White Cedar *Thuja occidentalis L.*

The White Cedar, or Arbor Vitae, is associated in one's mind with swampy conditions. It is a medium-sized tree, much smaller than the cedar of the Pacific Coast region. It is common everywhere in the province and extends to James Bay, but in the west does not go so far north.

White Cedar has very light and soft wood which is noted for its durability. It has always been the favourite species for posts, poles, shingles, canoes, and until late years, for ties.

The leaves (Fig. 36) are scale-like bodies lying close along the twigs and branchlets and seldom exceeding ⅛ inch in length. They are arranged in pairs opposite each other, and since each pair is placed at right angles to the pair below, all the foliage is in 4 rows on the stem. The leaves on the upper and lower faces of the spray are flat, pressed close to the twig and branchlet, and with their tips overlap the bases of the next pairs of leaves higher up. The leaves in the two lateral rows are not flat, but folded boat-like, and partially cover the facial pairs of flat leaves just described. The result is that the twigs and branchlets are completely hidden by the 4 rows of closely overlapping scale-like leaves and are flat; and since the lateral branchlets come off in one horizontal plane the White Cedar has a very characteristic flat spray. The leaves at the very tips of the spray are not as much flattened and have long slender points (awl-like).

The flowers are in general of the pine type except that the arrangement in the cone-like cluster is not spiral, but in pairs alternately at right angles, as the leaf arrangement.

The cone is oblong, about ⅜ inch long, with the cone-scales in pairs and the successive pairs in turn at right angles to each other (Figs. 37, 38). There are usually 2 seeds to each scale, each seed with two lateral wings which practically surround the seed body.

The native White Cedar is used often for hedges, but for landscape work the choice is usually from the many horticultural forms of it which have been developed.

Two relatives of it are planted to a limited extent in southern Ontario. One is the SOUTHERN WHITE CEDAR *(Chamaecyparis thyoides (L.) B.S.P.)* also known as False Cypress, from the Atlantic seaboard of United States, and the other is SAWARA CYPRESS *(C. pisifera (S. & Z.) Endl.)* from Japan. Both resemble a cedar in general, but the leaves are very similar to those of the Red Cedar *(Juniperus virginiana)* described next; unlike the latter, however, the fruit is not berry-like, but a spherical cone about ¼ inch in diameter, bluish-purple with a bloom in the Southern White Cedar and brown in the Japanese species.

It may be mentioned that the well-known shrubby Retinisporas, which are introduced from Japan, are derived mainly from the Sawara Cypress, known also under the name *(Retinispora pisifera S. & Z.)*. They are nursery forms in which, by successive cuttings, the juvenile type of foliage of Chamaecyparis is perpetuated and the varieties fairly well fixed. The leaves are linear, spreading, arranged in pairs, and recall somewhat those of the Common Juniper, but they are not stiff and prickly like the latter, being quite soft and finer. Sawara Cypress in turn shows several varieties. Certain other Retinisporas are derived similarly from other species of Chamaecyparis and from Thuja.

Red Cedar *Juniperus virginiana L.*

This tree, less commonly known as Juniper, is found sparingly throughout the more southerly portion of Old Ontario. It must not be confused with the very important tree of British Columbia *(Thuja plicata Donn.)* which furnishes the red cedar lumber and shingles of the lumber dealer's yard in Ontario.

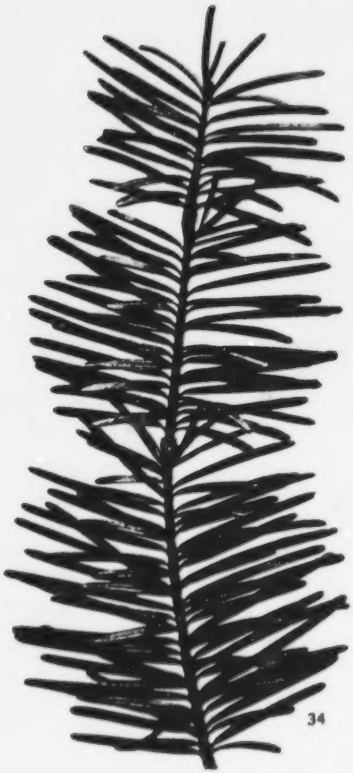
It is a very small tree used almost entirely for lead pencils and clothes chests. Its purplish-red colour and characteristic odour are well known.

The leaves are scale-like, much smaller than those of White Cedar, but with the same overlapping arrangement in pairs and the pairs alternately crossed at right angles. The successive pairs are alike in shape, not a flat pair alternating with a boat-shaped pair as in White Cedar. The fine stems covered with the 4 rows of leaves are thus not flat but have a plaited-cord-like appearance (Fig. 40).

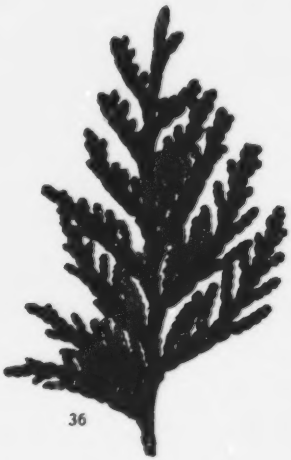
Occasionally, especially on young trees and on vigorous branchlets, one encounters a different type of leaf. This is about ½ inch long, narrow, long-pointed, not overlapping, but scattered and spreading, in pairs or whorls of three.

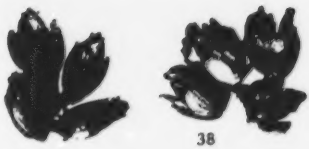
The flowers are unisexual, with the two kinds usually on different trees.

The scales of the cone are succulent, producing a fruit superficially recalling a blueberry. It is ⅛ to ¼ inch in diameter, dark blue with a bloom, and usually contains 1 or 2 seeds (Fig. 39).

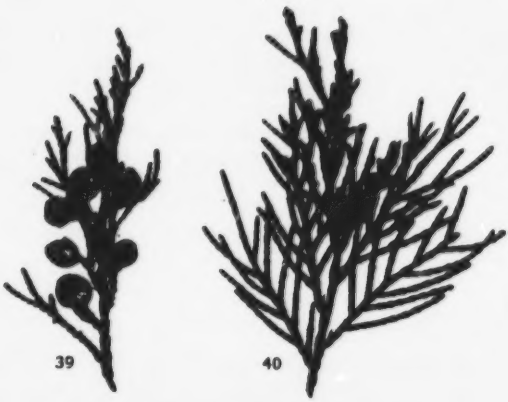


34, 35. Balsam.





36, 37, 38. White Cedar.



39, 40. Red Cedar or Juniper.

(All figures natural size).

There are, besides the Red Cedar, some shrubby members of this genus. The est known is the COMMON JUNIPER *(J. communis L. var. depressa Pursh)* which rows usually in semi-prostrate and ascending round masses 3 or 4 feet high. Its eaves are awl-shaped, ½ inch long, very prickly, and stand stiffly away from the ranch, in whorls of three. Since the fruit requires three years to mature, one finds hem on the shrub in all stages.

Many varieties of Juniper are used for ornamental planting in the province, the commonest being the SAVIN of Europe *(J. sabina L.)* with its varieties and the IRISH JUNIPER *(J. communis L. var. hibernica Gord.)*. The former is shrubby and the latter is of compact and upright form.

The GINKGO OR MAIDENHAIR-TREE *(Ginkgo biloba L.)* (family *Ginkgoaceae)* from China is planted occasionally as an ornamental subject. Although a conifer it has broad leaves which fall each autumn. These are 2 or 3 inches across and strikingly opened-fan-shaped with a long, slender stalk. They are very closely parallel-veined, and more or less 2-lobed. In the winter, it is recognized by its trunk being continuous into the crown, with unusually long branches which are studded with stout knob-like lateral branchlets like those of the Tamarack but much larger. On these branchlets the leaf-scars may be seen, each showing 2 bundle-scars. In Tamarack there is only 1 bundle-scar to a leaf-scar but they are difficult to see without a hand lens.

THE BROAD-LEAVED TREES

The broad-leaved trees, deciduous trees, or hardwoods, are much more complex in their flower and fruit characters than the conifers, showing great variability in these as well as in other recognition features.

Two groups are recognized, namely, those that bear flowers in catkins, and those that do not. The former includes four families: Salicaceae, Juglandaceae, Betulaceae, and Fagaceae. The remaining families are in the second group.

Ontario has over 75 broad-leaved species and these make up almost 40 per cent of the primary growing stock on the productive forest land in the province. Four species make up over 90 per cent of this wood volume. These are poplar (which is mainly aspen but includes all four species of poplar), white birch, yellow birch, sugar maple. Of the wood volume, poplar forms almost one-half, white birch over one-quarter and sugar maple and yellow birch the remainder. The rest of the hardwood wood volume, less than 10 per cent of the total, is accounted for by the remaining 65 hardwood species. Poplar can be seen then to be, on the basis of wood volume, the principal hardwood species, with white birch second.

THE WILLOW OR POPLAR FAMILY
SALICACEAE

This family includes two genera: *Salix* and *Populus*. These contain species important in the regeneration of our forests following cutting or burning, or both, since wherever they occur in stands that are harvested they can produce an early forest cover following the removal of the previous stand. This early cover results from the ability of the trees to produce new ones from roots that survived under the protection of the soil while the previous stand was being removed. Trees resulting from this method of reproduction have a large root system to draw on (the roots of the old trees) and develop rapidly, producing new trees 2 to 6 feet high in one growing season. Trees growing from seeds would take up to 10 years to attain similar heights.

This early shade of the area protects small seedlings in their early years and, owing to the sparce open crowns of the protectors (a natural growth habit of poplars and willows), they are given sufficient light to develop.

Some of the species of the family are difficult to determine because of the habit of hybridization amongst poplars and willows. Many forms, hybrids, and varieties have been described but only the well-determined species are dealt with here.

THE WILLOWS
SALIX

The willows, with some twenty species native to eastern Canada and several introductions from Europe which have become naturalized in various localities, have relatively few species in Ontario that can be classed as trees rather than shrubs. Even

hen arborescent in size, many of them occur after the clustered manner usually ssociated in one's mind with shrubs.

As a group, the willows have leaves mostly long, narrow and pointed, and altern- tely arranged. The flowers, which appear before or with the leaves, and the fruit, in eneral, resemble those of the poplars (Figs. 41, 42, 43). The "pussies", which are o popular, are flowers from species of willow whose leaves do not appear till later.

The wood is light and soft, and as few species reach large size, the tree is of no economic importance here. Some use is made in reclamation work, because willows start so readily from cuttings and grow very rapidly. Some species are used in making baskets.

The identification of the species is made mainly on flower and fruit characters, and this is complicated by the fact that the two kinds of flower are on different specimens, and in addition, willows hybridize freely. The group is one for the specialist.

In the winter condition, willows are told easily by their buds (Fig. 190). These are flattened more or less on the side nearest the twig, and each shows but one covering scale (in reality two scales fused). The leaf-scar is crescentic and shows 3 bundle-scars.

Black Willow *Salix nigra Marsh.*

This is the common native species of distinct tree habit and size, with dark rough bark, and usually several stout stems in a cluster. It is met with freqently in the moister places in the forest. The leaf (Fig. 48) is about 3 inches long by ½ inch wide (lanceo- late) with a long tapering point, very finely serrate on the margin, and practically as green on the under surface as above. This greenness beneath is characteristic. The crown has a very open appearance.

Peach-leaved Willow *S. amygdaloides Anderss.*

This becomes a larger tree than the preceding. The leaf is lanceolate to ovate- lanceolate, finely serrate, quite pale or glaucous beneath, with stalks often reddish Fig. 45).

Shining Willow *S. lucida Mühl.*

This is a small tree with finely serrate, very commonly ovate-lanceolate leaves Fig. 44). It is recognized by the high, varnish-like lustre of both surfaces of the leaf nd of the last season's twigs, hence, the specific name, lucida.

Long-leaved or **Sand Bar Willow** *S. interior Rowlee*

This small tree is characterized by the narrowness of the leaf. These are practi- ally without stalks, and the margin shows projecting bristle-like teeth spaced quite ar apart (Fig. 47).

Glaucous Willow *S. discolor Mühl.*

This small tree shows considerable variation in its characters. The leaf is lanceolate to elliptic in outline, sometimes broadest above the middle, glaucous-whitish under- neath (discolorous), with the margin remotely crenate-serrate or almost entire (Fig. 46). This is the species most commonly called Pussy Willow.

Beaked Willow *S. bebbiana Sarg.* (syn. *S. rostrata Richards.)*

The name has reference to the fruit. This is probably our commonest small willow. The leaf is very variable, very frequently elliptic-oval in shape, differing from all the

Willow
41. Staminate Flowers.
42. Pistillate Flowers.
43. Fruits.

44. Shining Willow.

45. Peach-leaved Willow.

46. Glaucous Willow.

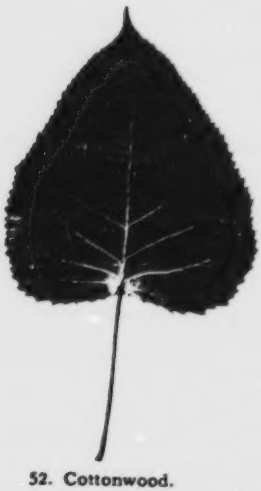
47. Long-leaved Willow.

48. Black Willow.

49. Beaked Willow.

50. Aspen.

51. Balsam Poplar.



52. Cottonwood.

53. Large-toothed Aspen.

(Leaves reduced one-half; other figures natural size).

receding species in its relative breadth, at times one-half as broad as long. The under surface is quite hoary, with the veins very prominent (Fig. 49).

We have four common introductions from Europe where they are much cultivated. From the original plantings for ornamental purposes here, they have spread freely and become more or less established. They are all rough-barked, medium-sized trees, furnishing varieties or hybrids.

WHITE WILLOW *(S. alba L.)* — This tree has narrowly lanceolate leaves with fine close serrations. They are covered with silky hairs on both faces, giving a whitish appearance, hence the name.

GOLDEN WILLOW *(S. alba var. vitellina (L.) Stokes)* — The leaves of this willow lack the silky hairiness of the former and are bluish-white below. It gets its name from the characteristic, bright yellow twigs in winter, but these are at times reddish.

CRACK WILLOW *(S. fragilis L.)* — This species derives its name from the ease with which twigs break off in a storm, littering the ground, especially in spring. The leaf is more broadly lanceolate than in the White Willow, with the teeth coarser and farther apart. It grows to a large size.

WEEPING WILLOW *(S. babylonica L.)* — Our Weeping Willow is either this species or varieties, which in turn may be hybrids. Only the pistillate tree is known in cultivation. Despite its scientific name, its home is China.

THE POPLARS
POPULUS

The poplars are a group of fast-growing, short-lived trees characteristic of the north temperate zone. Four species are native to Ontario, the Aspen and the Balsam poplar occurring throughout the province, while the other two do not extend north of the Height of Land. In the northern portion of the province, poplars, especially the aspen, often cover extensive areas of forest land following fire and logging. In such cases, they serve the useful purpose of a nurse crop to the more important evergreen trees later developing on the area.

Poplar lumber is used for veneer, small woodenware, slack cooperage, inside work in furniture, etc. As a pulpwood species in the province it is the leading hardwood.

The leaves of poplars are long-stalked, thick, somewhat leathery with a few (usually) variable-sized, seldom straight, lateral veins that wander off at irregular intervals from the midrib (Figs. 50 to 53).

The trees flower before the leaves appear. Both staminate and pistillate flowers are in catkins, only one kind on a tree, and resemble those of willows (Figs. 41, 42). The fruit is mature by the time the leaves are fully grown, and the little pods at once split open, filling the air with innumerable minute seeds provided with long, white, buoying hairs (Fig. 43).

The bark on young poplars is smooth and yellowish, or grayish-green to gray, on old trees becoming quite dark and furrowed.

The four native species described below are easily told apart by the shape of the

leaf, and the type of toothing around the margin. The first two have minute teeth, and the last two relatively large teeth.

Besides these and the three or four common exotics, one may expect to encounter poplar trees which do not fit into any description, especially around towns and cities. These puzzles arise out of the habit which poplars have of hybridizing freely.

Aspen *Populus tremuloides Michx.*

This tree has the smallest leaves of the four species (Fig. 50). The leaf blade is of a bulged-roundish shape about 1¾ to 2 inches each way, minutely toothed, with a sharp point. Because of the long, slender, flattened petiole, the leaves are very unstable and the Aspen "trembles" with a slight air movement more readily than any of the other species and hence the specific name. In northern latitudes, the bark is very light in colour, and from a distance may be mistaken for White Birch.

Balsam Poplar *P. balsamifera L.*

The name is derived from its resinous fragrance. It is also known as Tacamahac and Balm of Gilead. The leaf (Fig. 51) is ovate, gradually tapering to a long point, with fine rounded serrate teeth. It is silvery-white beneath, usually becoming resinous-rusty. The leaves of the other three species are green on the under surface. The leaf-stalks are round and not flattened laterally as is the case with our other native species.

Large-toothed Aspen *P. grandidentata Michx.*

The characteristic feature of this tree, as is expressed in the scientific name, is the wavy or looped margin of the leaf with the teeth prominent and irregular (Fig. 53). The blade varies considerably in shape, from ovate to roundish oval or even almost circular in outline. The Large-toothed Aspen is at once picked out in the forest when the leaves are unfolding in the spring by the downy appearance of the whole crown contrasted with the green of other species.

Cottonwood *P. deltoides Bartr.*

The leaf of this species is roughly the shape of an equilateral triangle (deltoid), and the margin has rounded teeth curved forward (Fig. 52)

WINTER TWIGS OF POPLARS

Poplar twigs have a 5-pointed pith and the leaf-scars arranged in more than two rows up the twig. The leaf-scar varies in shape from crescentic to inversely triangular to 3-lobed. In each leaf-scar there are 3 bundle-scars, one or more of which may be subdivided into a small group. The buds along the twig differ from those of other trees in having the lowermost bud-scale placed directly above the leaf-scar and facing outwards away from the twig. Usually two sizes of buds will be noticed, the smaller ones being leaf-buds and the stouter ones flower-buds.

In the Aspen, the twigs are quite slender, and in the other three they are stout. The end or last leaf-bud is about ¼ inch long, conical, very sharp-pointed, shiny, dark reddish-brown, smooth and clean-looking, practically non-resinous and with little fragrance (Fig. 191).

In the Balsam Poplar the end bud is much like that of an Aspen on a much larger scale. It is ¾ inch long, sticky-resinous and fragrant (Fig. 193).

The bud of the Cottonwood is very similar to that of the preceding poplar in all respects, but generally not so fragrant, less conical and more angled, and not so dark red in colour. Compared with Balsam Poplar the twigs are lighter in colour, being

ther yellowish-brown than reddish-brown, and they are usually angled (Fig. 194).

The Large-toothed Aspen is the only native species whose bud is not shiny, but vered with a dull, dusty wool. Otherwise, it is much like the Aspen bud, but stouter Fig. 192).

FOREIGN POPLARS

LOMBARDY POPLAR *(P. nigra L. var. italica Muenchh.)* — This is the commonly planted poplar with the narrow spire-like crown. The leaves are rhombic-deltoid in shape and have a finely scalloped margin. It is considered by many to be a hybrid clone.

WHITE OR SILVER POPLAR *(P. alba L.)* — This is the Common Abele of Europe. It is characterized by great variety of shape of leaf, from narrowly oval to that resembling the Large-toothed Aspen. The margin is irregularly wavy-toothed or even lobed, these latter cases reminding one somewhat of a maple leaf and hence the tree is at times locally known as a maple. It is recognized most easily by the dense mat of white wooly hairs on the under surface of the leaves and on young branchlets; this is rarely absent.

CAROLINA POPLAR *(P. canadensis Moench var. eugenei Simon-Louis)* — This is thought to be a variety of a hybrid between our native Cottonwood and the Lombardy Poplar. Its leaves combine the characters of both. It is distributed extensively from nurseries for use in decorative planting and for reclamation of moving sand areas and eroding hillsides. It is a very fast grower.

BALM OF GILEAD *(P. candicans Ait.)* — The leaf of this tree resembles that of Balsam Poplar, but is rather heart-shaped. The teeth, however, are much larger than in Balsam Poplar, and both the undersurface of the leaf and the leaf-stalks are hairy. This tree is by some taken as variety subcordata of our Balsam Poplar, by others as an introduced species, with the possibility even of hybrid origin.

THE WALNUT FAMILY
JUGLANDACEAE

This family includes two genera: *Juglans* and *Carya*. They can be separated easily by their flowers and fruits. The staminate catkins of Juglans are simple; those of Carya are branched. The fruit husk clings to a sculptured nut (indehiscent) in Juglans; in Carya, it sheds readily from a smooth-shelled nut. Pith differences also occur which are explained in the text.

WALNUT AND BUTTERNUT
JUGLANS

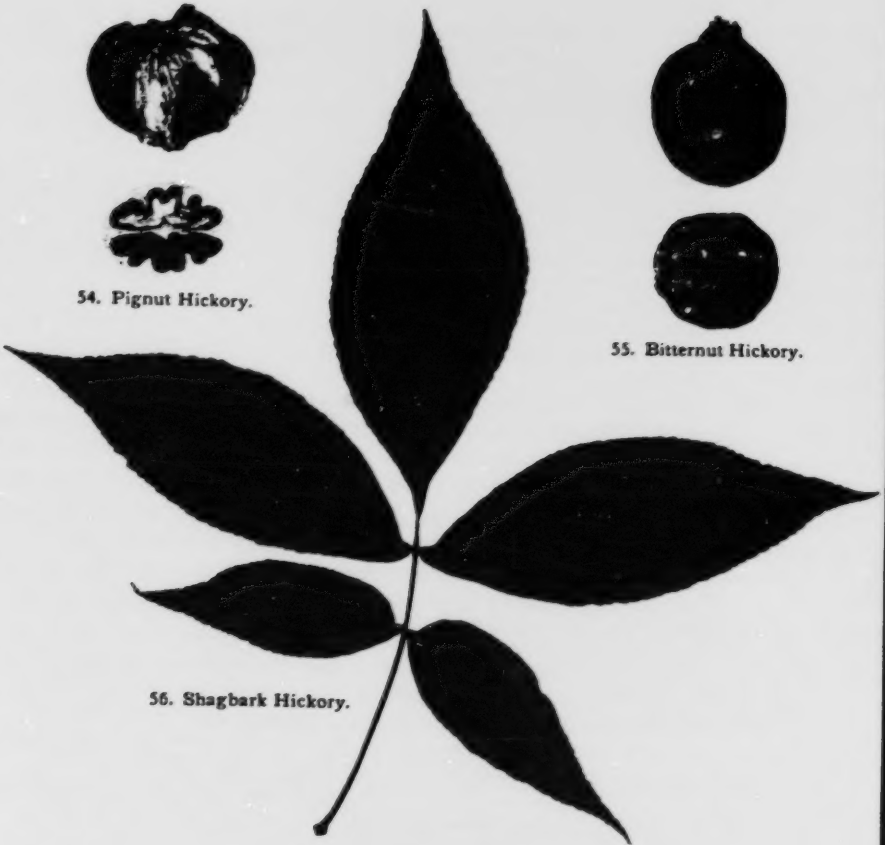
Butternut *Juglans cinerea L.*
Black Walnut *Juglans nigra L.*

Of this genus, these two species are native to the province. They are southern trees, growing among other hardwoods of Old Ontario, only, and noticeable on account of their coarse, or heavy, alternate branches.

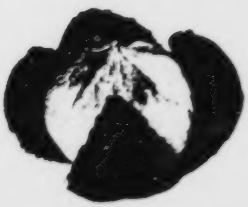
The leaves are a foot or more long by about 6 inches wide. They are compound,

54. Pignut Hickory.

55. Bitternut Hickory.



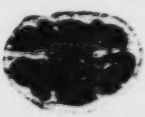
56. Shagbark Hickory.

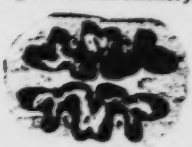


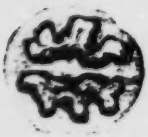
57. Shagbark Hickory.

58. Big Shellbark Hickory.

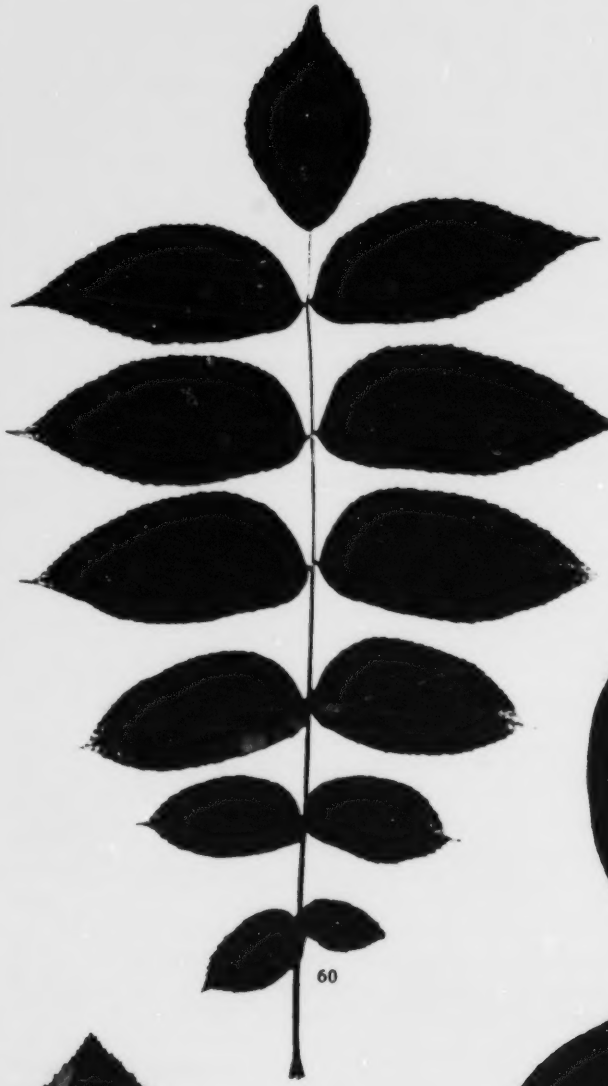
59. Mockernut Hickory.

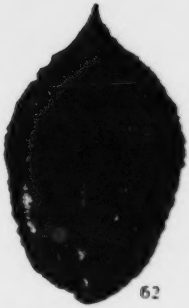






(Fruits natural size; leaf one-half).





60, 61, 62. Butternut.
63, 64. Walnut.
65, 66. Gray Alder.

(Leaves one-half; others natural size).

made up on the average of 11 to 17 serrate leaflets arranged along each side of the stalk (Fig. 60).

The trees flower as they are leafing out (Fig. 67). The staminate flowers are in heavy, drooping catkins some 4 inches long, while the pistillate ones occur singly, or in a small cluster of usually 2 or 3 and seldom exceeding 5, farther along at the end of the new shoot. Unlike the poplars, both kinds of flower occur on the same tree.

The fruit is a large, edible nut with a rough, sculptured or irregularly furrowed surface and covered with a fleshy husk. The nut industry, centred commercially in southern California, is based on *(J. regia L.)*, a native of southeastern Europe, but usually known as English Walnut.

The wood of Black Walnut has excellent technical qualities, making it one of our most desirable woods for the manufacture of furniture and fixtures, for interior finish of buildings and offices, and for cabinet-work. The original supplies in the province are largely exhausted. Butternut wood is soft and suitable only for small woodenware.

The two trees are separated readily by their foliage, fruit, bark or twigs.

LEAF.—The under surface of Butternut leaflets, the leaf-stalk, twigs and husk of fruit are densely hairy, the hairs in the fresh condition being clammy; in Walnut the hairiness is insignificant.

FRUIT.—The fruit in the Walnut is roughly spherical, and ellipsoid in Butternut. The surface of the nut is deeply grooved in the former, but cut into irregularly jagged areas in the latter (Figs. 61 to 64).

BARK.—Walnut bark is narrowly furrowed, and rather uniformly gray to black. In the Butternut, the furrows are relatively broader, and the ridges conspicuously flattened on top and light ashen-gray in colour (cinereous).

TWIG.—The twigs of these two trees are stout, and recognized by their peculiar pith. This shows cavities alternating with partitions, when the twig is cut lengthwise (Fig. 255). The Hackberry also has this type of pith, but its twigs are quite fine.

The leaf-scars are large, conspicuous marks, each showing 3 prominent groups of bundle-scars. The upper margin of the leaf-scar in Butternut is straight and is bordered with a hairy, fur-like ridge; whereas in the Walnut this edge is notched and no hairy ridge is present (Figs. 200, 201).

The terminal bud of Walnut averages $^{5}/_{16}$ inch in length and about as broad; that of Butternut is about ½ inch long, considerably less in breadth, somewhat flattened, and lighter in colour. In both, one may find two (or even more) buds above a leaf-scar, the two of different shapes (Figs. 200, 201).

THE HICKORIES

CARYA (syn. Hicoria)

Shagbark or **Shellbark Hickory** *Carya ovata (Mill.) K. Koch*
Big Shagbark or **Big Shellbark Hickory** *Carya laciniosa (Michx.f.) Loud.*
Mockernut or **White-heart Hickory** *Carya tomentosa Nutt.*
Pignut Hickory *Carya glabra (Mill.) Sweet*
Bitternut Hickory *Carya cordiformis (Wang.) K. Koch*

The Red Hickory *(C. ovalis (Wang.) Sarg.)* of some authors is not recognized here as sufficiently distinct from Pignut Hickory to be included as another species.

Our hickories are timber trees growing in the Deciduous Forest region. Shagbark nd Bitternut are the commonest.

Hickory wood is hard, strong, tough, and resilient to twists and impacts. It has o equal as vehicle stock and handle stock for tools. Because of the very limited native upply, the annual needs of the wood-using industries of the province are met by impor- ation from United States almost completely.

The hickories have large, compound, pinnate leaves of 5 to 11 leaflets (Fig. 56). Their flowers, in general, resemble those of the Walnut shown in Fig. 67. The fruit is a nut enclosed in a husk which splits and falls away from it more or less readily.

The determination of the species of a hickory is at times rather troublesome. While one gets to recognize a certain type of leaf as accompanying each species, yet the leaves of all are very variable in size, and on the whole leaves alone are unreliable for identification purposes. The fruit also varies a great deal both in size and shape, on separate specimens and in different localities; part of this is due to the kernels not developing, and such must be ignored in identification work. Due to the variation, we find much lack of agreement in "tree books," many varieties named, and hybrids even occurring. Of our five native species, the Pignut varies most. Hence, in naming hickories, one must take into account as many characters as possible, particularly the fruit.

FRUIT.—The fruits of hickories differ in four particulars which are trustworthy — thickness of shell in relation to size of cavity inside, thickness of husk and extent of its splitting, and taste of meat inside. These are illustrated in Figs. 54 to 59.

In the Mockernut, the shell is extremely thick; the nut is mainly shell with little meat, hence its name. In the Bitternut, it is so thin one cuts it across readily with a pocket knife. The shell in the other species is moderately thick.

The husk of the fruit is quite thin and friable in Pignut and Bitternut; in the other hree species, it is thick and woody, and averages somewhat thinner in the Shellbark han in the Big Shellbark and Mockernut. As a rule, the husk splits, as the fruit matures, ll the way to the base in the Shagbark, Big Shagbark and Mockernut; in the other two, he splitting extends only to the middle or very slowly to the base.

The nuts of the Bitternut and Pignut are not edible.

The general relative sizes are as shown in the illustrations.

BARK.—Two types of bark are met with on mature hickory trees. In the Shagbark nd Big Shagbark it "shags" or "shells" off in long, flat plates which are free at their wer ends or both ends. The trunks have thus a very characteristic, unkempt appear- nce. In the other species, the bark remains firm and does not "shag" except ccasionally on Pignut to a slight degree.

Mockernut has a very gray bark broken by irregular, interrupted furrows into rounded, smooth-topped ridges.

The bark of the Bitternut is close and shallowly fissured into narrow ridges. In time, the fissures become stretched out into somewhat diamond-shaped areas.

Pignut is the most variable of the hickories in its bark features. Mostly, its bark is firm and fissured, but with very large trees the ridges become more flattened and show a tendency to become loose at the ends. This gives more or less an approach to the shaggy type.

TWIG.—The toughness of hickory twigs is well known. Those of Pignut and Bitternut are comparatively slender, but the others are coarse.

The leaf-scars are large and conspicuous, varying in shape from a broad V through a heart-shape to semicircular, according to the relative height at the centre of the scar. The bundle-scars are numerous and variously arranged.

BUD.—The winter buds of hickory are very useful in telling the species. The differences lie mainly in size, shape, and features of the outermost scales.

The Bitternut bud has a very distinctive colour since it is covered with glandular, mealy, dot-like, sulphur-yellow scales. The terminal bud is ½ inch long, slender, flattened, and mostly obliquely blunt-pointed. The buds along the sides of the twig are smaller and more or less 4-angled. Very often there are 2 or occasionally more buds above the leaf-scar, with the upper one much larger (Fig. 195).

The terminal bud in the Shagbark is about ⅝ inch long and ovoid. The outer scales are dark coloured with some of them showing the apex prolonged into a rigid point. These scales are loosely fitting towards the top of the bud, and gradually bend outwards throughout the winter, but do not fall off till the bud commences to open. The inner scales are densely downy on their outer surfaces (Fig. 197).

The bud of the Big Shagbark is similar to that of the Shagbark, but on a larger scale. The end bud averages ¾ inch (Fig. 198).

The Mockernut has a terminal bud of about the same length as that of Shagbark, but is very much broader and blunt. Since the outer scales fall off in early autumn, one sees mostly a stout, pale, densely hairy bud (Fig. 199).

The Pignut bud is rather variable, but its small size and slender twigs at once identify it among the hickories. It resembles the small lateral buds of the Shagbark. Before spring the outer bud-scales have fallen, and it then is like a diminutive Mockernut bud (Fig. 196).

THE BIRCH FAMILY
BETULACEAE

Four genera are included in this family: *Betula, Ostrya, Carpinus* and *Alnus*. Betula is the only genus with commercially important species . The HAZELNUTS, *Corylus,* also belong to this family, but all native species in Ontario are shrubs.

THE BIRCHES
BETULA

White Birch *Betula papyrifera Marsh.*
Yellow Birch *Betula alleghaniensis Britton (Syn. B. lutea Michx. f.)*
Black Birch *Betula lenta L.*
Gray Birch *Betula populifolia Marsh.*

These four species occur in the tree class in Ontario. The White Birch, also known as Canoe, Paper, or Silver Birch, is a northern tree found throughout the province. Yellow Birch, is known by several common names, Silver, Gray, Cherry, Black, or Sweet Birch, but these names are more commonly given to the other birches; the first to *B. papyrifera,* the second to *B. populifolia,* and the last three to *B. lenta.* The Yellow Birch is a more southerly species than White Birch, belonging in general, to the Great Lakes drainage area, but is found as far north as lake Abitibi. Black Birch, for many years a doubtful native species, is a tree of the Appalachian region.

is the most southerly birch and its only known occurrence is a small grove on private operty, on the north shore of Lake Erie, 3½ miles west of Port Dalhousie at the ot of Gregory Road. The Gray Birch is commonly called White, or Wire Birch. occurs in the eastern part of the province being common west of Brockville and stward.

The birches are well-known trees because of their characteristic bark. This is mooth and shows conspicuous horizontal, stroke-like markings (lenticels), and it has the feature of separating into thin, papery sheets around the trunk, except in Black Birch. Only on old trees is it of a roughened character.

The wood of Yellow, Black, and White Birch is valuable, but Gray Birch is a small tree of no commercial importance. The Yellow Birch is an important tree commercially. It has a fine-grained wood of a pleasing reddish colour, and frequently showing a wavy and curly grain. The wood is hard and strong, takes a high polish, and can be stained to imitate more expensive woods. It has extensive use in the manufacture of furniture and fixtures for houses, offices, schools and churches; in the interior finish of buildings, especially for flooring; and in the hardwood distillation industry. It is an outstanding veneer wood.

The White Birch is a smaller tree whose wood lacks the pleasing colour of the Yellow Birch, but as it makes up almost ⅓ of the hardwood volume of wood in the province, it must be considered an important birch species and one of our important hardwood trees. It is used for pulpwood, veneer wood, turnery and small woodenware.

The Black Birch wood is similar to that of Yellow Birch but the tree is rare in Ontario and has no commercial value.

The species of birch are distinguished by their leaf, fruit and bark.

LEAF.—The leaves of the three common species are quite easily distinguished as they differ in shape, number of veins, character of toothing and other features.

The leaf of the Yellow Birch is oval or oblong-ovate, 3¾ inches long, sharply doubly serrate all around the margin, and shows 12 or more lateral veins (Fig. 71). The leaf of Black Birch is similar to that of Yellow Birch.

The leaves of the other two common species have fewer lateral veins, averaging 9 or less; they are triangular or ovate in shape, and without teeth adjacent to the stalk usually.

The White Birch leaf averages smaller in size than that of the Yellow Birch, but is more variable in size and shape. It is much less rounded and full at the base than that of Yellow Birch, or even wedge-shaped (Fig. 72). Trees having leaves with a heart-shaped base have been made a variety by some authorities *(B. papyrifera var. cordifolia (Regel) Fern.)*.

The Gray Birch leaf is the smallest of the four, 2½ inches long, and distinctly doubly serrate. It is triangular-ovate in shape, with a long abruptly acuminate apex (Fig. 68a).

Leaves on young trees and vigorous shoots of birch are strikingly untypical.

FLOWER.—The birches are in full bloom as the leaves begin to appear. Both staminate and pistillate flowers are in catkins, both kinds on the one tree, and the former conspicuous on the tree during the winter preceding.

FRUIT.—The fruit is a minute nut margined with a filmy wing. The nuts lie loosely on the face of a small 3-lobed scale; many of these scales are attached temporarily by their ends to an axial stalk to form a catkin-like or cone-like aggregate. These are to be seen in large numbers on a birch tree from early spring till autumn.

The fruiting bodies of the three common birches differ in their size and shape as a whole and in the character of the fruit scales.

This body in both White and Gray Birch is narrowly cylindrical, and hangs down by a slender stalk; that of Yellow Birch is much broader in proportion to its length, and is almost sessile and erect. In White Birch it is 1½ inches long by ¼ inch at maturity; in Yellow Birch about 1¼ inches by ⅝ inch, and in Gray Birch ⅞ inch by $^{3}/_{16}$ inch (Figs. 69, 70, 68).

The scales of the "cone" in Yellow and Black Birch are ⅜ inch long, somewhat longer than broad, very hairy in Yellow Birch, but hairless in Black Birch, and have three finger-like lobes; those of the White Birch are one-half as long, are comparatively smooth, and the two lateral lobes usually point away strongly from the central lobe; the scales of Gray Birch are like those of White Birch, but barely ⅛ inch in length, finely hairy and the middle lobe is almost missing. The scales fall off much more readily from the supporting axis in the White and Gray Birches.

The wing on either side of the nut is broader than the nut itself in both White and Gray Birch; in the Yellow and Black Birch it is not broader and usually narrower.

BARK.—The bark of the trunk of White Birch and Gray Birch is very similar. It is creamy- or chalky-white in colour. On White Birch it is usually shiny, and peels off in papery strips to expose the inner reddish-orange colour (hence the name papyrifera), whereas Gray Birch bark is dull and does not peel readily. The Yellow Birch bark is yellowish- (luteous) or silver-gray, rolling back in thin, filmy, curly strips which hang as ragged, more or less longitudinal fringes; at times the Yellow Birch shows little peeling and on large trees the bark breaks up into large brownish plates. The Black Birch bark is dark brown to almost black tinged with red, smooth and lustrous, showing little or no peeling and on mature trees becoming thick and deeply furrowed and broken into large, irregular, yellowish-brown, firm plates.

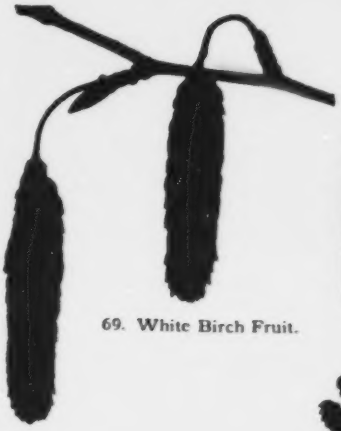
Young birch trees show reddish or dark brown bark similar to that of the branches of the older trees.

TWIG.—The winter twigs of birch are noticeably long and slender. Farther back on the branch one finds short, stout lateral branchlets curiously roughened all along by leaf-scars. The leaf-scars of birch are small, semi-oval and show 3 bundle-scars.

The buds are light reddish-brown, ¼ inch long, ovoid to conical in shape, pointed and diverge away from the twig. The bud at the end of each short lateral branchlet shows about 7 bud-scales (Fig. 205, lower half), but the buds along the side of the longer slender type of twig show only 3 scales, two of them reaching half-way up the bud and the third rolled around it (Fig. 205, upper half).

The twigs and buds of the birches offer a ready means of separating three of the species when in their winter condition. Yellow Birch and Black Birch buds are a uniform chestnut-brown colour; the twigs are yellowish-brown, and aromatic with a strong wintergreen taste. White Birch buds are greenish-brown with reddish-brown at the tips of the scales, often gummy; the twigs are dark, reddish-brown and like the Gray Birch lack the wintergreen taste. The buds of Gray Birch are a uniform brownish-gray colour; the twigs are slender, orange-brown to gray, and unlike the other two birches in that the lenticels are warty-glandular (Figs. 205, 206, 206a).

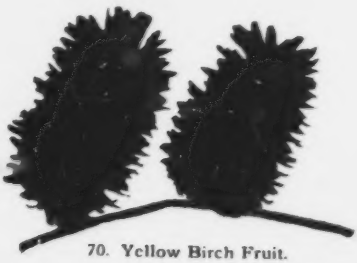
The EUROPEAN WHITE OR SILVER BIRCH *(B. pendula Roth) (syn. B. alba L.* in part) from northern Europe and Asia, in many forms — weeping, purple-leaved,



69. White Birch Fruit.

68. Gray Birch Fruit.

67. Walnut Flowers.



70. Yellow Birch Fruit.

68a. Gray Birch.

72. White Birch.

71. Yellow Birch.

(Leaves one-half; others natural size).

cut-leaved — is planted frequently. It resembles both White and Gray Birch in having similar bark and pendulous fruits, but differs in its rhombic shaped leaves which are smaller than those of White or Gray Birch and do not have the elongated acuminate tips of Gray Birch. It has fruit less than half the size of White Birch but somewhat larger than that of Gray Birch. The twigs are slender and usually pendulous.

Hop Hornbeam *Ostrya virginiana (Mill.) K. Koch*

This tree and the Blue Beech described below are southern trees occurring here and there in mixed woods in Southern Ontario. The wood of both is very heavy, hard and strong, and that of the Hornbeam is used locally for tool handles, mallets, etc.; but both species are too small and occur too sparingly to give them any commercial importance.

The name Hornbeam is applied also to the Blue Beech, and both are sometimes known as Ironwood.

LEAF.—The leaves of the Hop Hornbeam are about 4 inches long, pointed and narrowly oval in shape with a gradual taper to the slightly rounded base. Generally several of the lateral veins fork near the margin as in some of the elms. The margin is doubly serrate with sharp teeth, and the leaf resembles that of the Yellow Birch, but the latter is of thicker and firmer texture, and not hairy on the undersurface between the veins which seldom fork (Fig. 73).

FLOWER.—The flowers of the Hornbeam, Blue Beech, and Gray Alder are very similar to those of the birches.

FRUIT.—The fruit is a flattish, ellipsoid nut about ¼ inch long enclosed at the bottom of a bladdery, elliptical bag ¾ inch long by ½ inch wide. About a dozen of these bags are clustered together along the ends of the twigs in an overlapping arrangement, recalling a bunch of hop fruits, hence the name (Fig. 74).

BARK.—The bark of the Hop Hornbeam is thin and broken into narrow, flattish strips, loose at the ends, and scaling off readily when rubbed.

In the winter the Hornbeam at first sight recalls a young elm, but the bark of the latter is ridged and firm, not scaling off, the branchlets are not so slender, staminate catkins are never present, and the buds are quite different, as stated below.

TWIG.—The twigs of the Hornbeam and Blue Beech (Figs. 202, 203), are very slender, with those of the Hornbeam averaging the coarser.

The leaf-scars of both are very small, elliptical or semicircular in shape, usually show 3 bundle-scars, and are arranged in two lines or ranks along the twig.

The buds of the Hornbeam (Fig. 202) are ovoid, divergent, sharp pointed, measure ⅛ to $^3/_{16}$ inch in length and are usually greater in diameter than the thickness of the twig, whereas on Blue Beech twigs (Fig. 203) the buds are appressed, somewhat flattened, bluntish, and generally of a smaller diameter than the thickness of the twig. The Hornbeam tree practically always shows a goodly crop of staminate flower catkins present in the winter, while these are not visible on the Blue Beech. The fact that the bud-scales are arranged in 4 rows approximately will distinguish the twigs from those of elm, in which the scales are in 2 rows; and the larger number of scales present on all buds (8 to 12) will separate them from birch buds.

Blue Beech *Carpinus caroliniana Walt.*

This tree is sometimes called Hornbeam and Ironwood, as the foregoing species.

LEAF.—The leaves are difficult to distinguish from those of the preceding tree, but when the two are placed side by side some differences, however, are to be made out. In the Blue Beech the leaf is on the average slightly smaller, fuller or more rounded at the base, teeth more distinctly of two sizes, veins seldom forking at the ends, not quite so soft downy to the touch on the under surface and of somewhat firmer texture between the fingers (Fig. 75).

FRUIT.—The fruit is a small, ovoid, ribbed nut placed at the base of an irregularly 3-lobed curved leaf about 1 inch long; the long middle lobe is toothed on one side only. These are arranged in pairs facing each other in a loose cluster about 2½ inches long at the ends of the twigs (Fig. 76).

BARK.—The surest recognition feature is the trunk, which has conspicuous rounded, longitudinal ridges alternating with shallow depressions, so that a cross section of the stem has a wavy outline. No matter how young the tree, these ridges may be felt.

The bark is unbroken, like the true Beech, but is dark bluish-gray, not whitish-gray. The buds of the Beech also are at least six times as long as those of the Blue Beech.

TWIG.—Like the Hornbeam, the Blue Beech exhibits a very fine branching system; in the winter this is heightened by the multitude of slender, curved stalks which carried the fruit. Staminate catkins, however, are not in evidence as in the former, being retained within the buds till spring.

The bud-scales are whitish on the margin(Fig. 203)—a good recognition feature. Other bud characters are given along with those of Hop Hornbeam above.

Gray Alder *Alnus rugosa (Du Roi) Spreng. (syn. A. incana (L.) Moench)*

The eastern alders as a group are shrubs, but this species perhaps may be classed as a tree. It grows in wet situations throughout the province, but has no forestry value.

LEAF.—The leaf is ovate, 3 inches long, stiff, thick-textured, strongly doubly serrate, and the lower surface is hoary (incanous), with the veins conspicuously projecting and rusty-brown in colour (Fig. 65).

FRUIT.—The Alder fruit is a woody, cone-like structure about ⅝ inch long by half as wide. The seeds resemble those of birch, as does the whole fruit except that it is firm and woody (Fig. 66).

BARK.—The bark is reddish-brown, smooth, and marked with elongated orange lenticels.

TWIG.—In the leafless condition the Alder is recognized very easily.

The pith of the twig is triangular in cross section. The bud is dark reddish-brown, stalked, and covered with 2 (at times 3) spoon-shaped bud-scales face to face (Fig. 204).

The fruits of the past or more seasons are prominent, and the next year's flower catkins. The staminate catkins are reddish-brown, cylindrical bodies, about ¾ inch

73

75

74

73, 74. Hornbeam.

76

75, 76. Blue Beech.

77

78

79

77, 78, 79. Chestnut.

(Leaves one-half: fruits natural size)

ng, and grouped in threes usually; the pistillate are similar except that they are only ¼ inch long.

The BLACK ALDER *(A. glutinosa (L.) Gaertn. (syn. A. vulgaris Hill)* is an European and Asiatic timber species which is planted occasionally. It can be recognized by its very dark green, shiny leaves, which are ovate or nearly circular in outline, with a coarsely dentate margin. The fruit is similar to that of the Gray Alder but almost twice as large. It grows into a medium-sized tree.

THE BEECH FAMILY
FAGACEAE

The Beech family comprises three genera in Ontario: *Fagus, Castanea,* and *Quercus.*

Beech *Fagus grandifolia Ehrh.*

The Beech is a very common tree throughout Southern or Old Ontario and extends into the southernmost portion of Northern or New Ontario.

It is of much less commercial importance to eastern Canada than the European Beech is to western Europe. The wood is used indiscriminately with maple and birch in the cheaper furniture and flooring; it is used for destructive distillation, slack cooperage, basket veneers, and small turnery and woodenware. It is also a common fuelwood and tie timber.

The leaf, fruit, twigs and bark are totally distinct from those of any other Ontario tree.

LEAF.—The leaf is oblong-ovate, 4 inches long, on a stalk ¼ inch long, and very prominently straight-veined, each vein ending in a projecting tooth with no intervening teeth. The texture is noticeably firm, almost leathery (Fig.80).

FLOWER.—The flowers appear after the leaves have unfolded in the spring. They are unisexual; the staminate clustered at the end of a long stalk (in a head); the pistillate 2 to 4 in a small cluster, somewhat resembling those of the oaks.

FRUIT.—The fruit is a 4-valved, prickly, reddish-brown husk containing 2 sharply pyramidal, brown, edible nuts about ½ inch long (Fig. 81).

BARK.—The bark of Beech is smooth and of an attractive bluish- to whitish-gray colour, often mottled.

TWIG.—Beech twigs show mostly semicircular leaf-scars in which the bundle-scars are numerous but hard to make out. From either corner of the leaf-scar there runs around the twig a line-like mark (stipule-scar); these do not meet to encircle the twig since one line bends upward and the other downward.

The terminal bud is ¾ inch long, slender, very sharp-pointed, and chestnut-brown in colour; the lateral buds are nearly as large, each standing off almost at a right angle to the twig. The bud-scales are in 4 rows, each scale frequently gray-tipped (Fig. 207). The scales are very numerous, and on falling off when the bud opens an area of the twig is left marked by a series of fine ring-like scars. These places can be seen at intervals along the branchlet and indicate the former positions of buds.

For ornamental purposes, the EUROPEAN BEECH *(F. sylvatica L.)*, whose leaf has fewer lateral veins, is much broader and less regularly serrate, is sometimes cultivated — mostly the weeping, purple-leaved, or cut-leaved forms.

Chestnut *Castanea dentata (Marsh.) Borkh.*

This tree must not be confused with the so-called chestnut planted on streets. It is a southern species, occurring only in peninsular Ontario, and known for its sweet, edible nuts. It is seldom seen now having been almost completely destroyed by the blight, Endothia parasitica (Murr.) A. & A.

Chestnut wood is noted for its durability, and prior to the Second World War considerable lumber was imported from United States into the province for many purposes. The supplies have been exhausted for many years now.

LEAF.—The leaf is oblong-lanceolate, 6 to 8 inches long by 2½ inches wide, not so straight-veined as the Beech. Its characteristic feature is the margin, as implied in the name dentata. Each vein after ending in a tooth is carried out beyond as a stout bristle curved towards the tip of the leaf (Fig. 77).

FLOWER.—The staminate catkins are some 6 to 8 inches long and very numerous, giving the tree a very striking appearance in the spring when the chestnuts are in bloom.

FRUIT.—The fruit is a spiny bur-like, globular husk, 2 inches in diameter, splitting generally into 4 valves, to release the 2 or 3 nuts. Since the pistillate flowers are mostly near the base of the staminate catkins, the fruits are topped with the remains of the latter as a rule (Figs. 78, 79).

BARK.—The bark is shallowly fissured between broad, flattish, usually oblique ridges.

TWIG.—The twigs are stout, mostly brownish and show a 5-pointed, star-shaped pith. The leaf-scars are in 2 or more rows, semi-oval, and contain scattered, inconspicuous bundle-scars.

The bud at the end is $^3/_{16}$ inch long, ovoid, chestnut-brown, and shows but 2 or 3 scales (Fig. 208).

THE OAKS
QUERCUS

Red Oak *Quercus rubra L.*
Black Oak *Quercus velutina Lam.*
Pin Oak *Quercus palustris Muenchh.*

White Oak *Quercus alba L.*
Bur or **Mossy-cup Oak** *Quercus macrocarpa Michx.*

Swamp White Oak *Quercus bicolor Willd.*
Chestnut or **Chinquapin Oak** *Quercus muehlenbergii Engelm.*
Rock Chestnut or **Chestnut Oak** *Quercus prinus L.*
Dwarf Chinquapin or **Dwarf Chestnut Oak** *Quercus prinoides Willd.*

Nine species of oak are native to the province, one of them not reaching tree size

ut listed here for completeness. In addition to these, a large-fruited Red Oak ommonly found in southern Ontario has by some authors been made a variety of Red Oak *(Q. rubra L. var. borealis (Michx. f.) Farw.)*. The majority of these species re not found outside the Deciduous Forest region. The White Oak extends somewhat arther north, while the Red and Bur Oaks reach the Height of Land.

Oak wood is hard, strong, tough, and durable. These qualities, coupled with its well-known figure, have made it universally used in the furniture, vehicle and agricultural implement industries, and for flooring and interior trim of buildings. For these uses the requirements of our various wood-using industries are almost wholly met by importation from United States since the home production of oak lumber is quite small.

Oak leaves are characteristically lobed or toothed, never to be confused with those of other trees.

The flowers of an oak are unisexual, the staminate being arranged in long, narrow, pendent catkins, and the pistillate ones singly or in small clusters (Fig. 84). They are to be looked for when the leaves are unfolding.

The fruit is a nut or acorn partially enclosed in a scaly cup. In identification, one must neglect fruits containing dwarfed acorns.

The winter twig is recognized by having a cluster of buds at the end and the lateral buds arranged in 5 rows up the twig. Since each leaf-scar is raised more or less on a longitudinal ridge running down the twig from the lower edge of the scar, the twig is in general 5-angled and its pith 5-pointed or star-shaped in cross section. Even the buds show a tendancy to be 5-sided with their scales arranged in 5 rows.

All species of oak show great variability in their characters. The leaves show a great range of shape within each species, and in the case of young sprouts the most freakish shapes and sizes occur. The same fact is apparent in the fruits, these varying greatly in size and shape, both as regards the fruit as a whole and the acorn alone. Nevertheless, despite the variability, certain characteristics are to be found which hold good in the case of each species, and enable its recognition. This is but one more illustration of the fact that identification of any tree is based more safely on all its characters — leaf, fruit, bud, bark, etc. — than on any one of them alone.

It will be convenient to describe the species of oak by groups.

RED OR BLACK OAK GROUP

This includes the three species — Red, Black, and Pin Oak.

LEAF.—The leaves of these three species are alike in that the lobes and the teeth on the lobes are sharp, and are tipped with a bristle; in these respects they differ greatly from the leaves of the other six species.

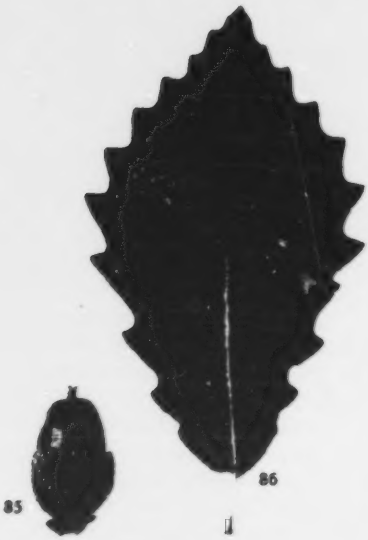
The leaf of the Pin Oak is singled out at once from the other two by its average smaller size, it being very deeply cut with the lobes tapering gradually, and having the lateral pairs of lobes practically at right angles to the midrib. Commonly it shows but 5 lobes (Fig. 102).

The leaf of the Red Oak differs from that of the Black Oak chiefly in two features, the shape of the lobe and its relative length. This results in a difference as to the depth to which the leaf is cut and as to the shape of the notch between two neighbouring lobes. The Red Oak leaf usually shows 7 or 9 lobes; the longest lobes, neglecting the end one, about equal in length the breadth of the broadish middle portion of the leaf between the opposing notches; and the lobes gradually decrease in width from the base of the lobe outwards to its tip (Fig. 95).

80, 81. Beech.

82, 83. Swamp White Oak.

84. Red Oak Flowers.



85, 86. Chestnut Oak.

(Leaves one-half; others natural size).

88

87, 88, 89. White Oak.

89

90

90, 91. Dwarf Chestnut Oak.

91

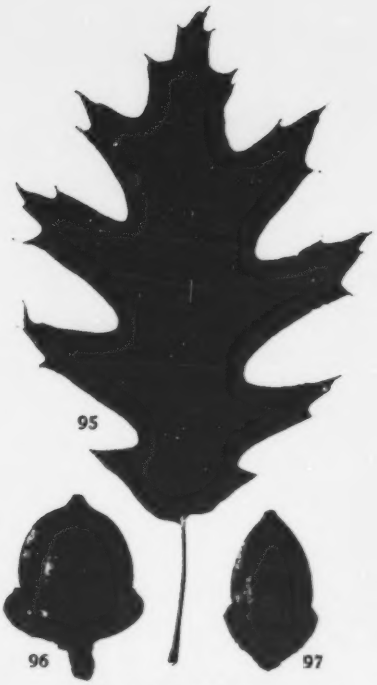
92

93

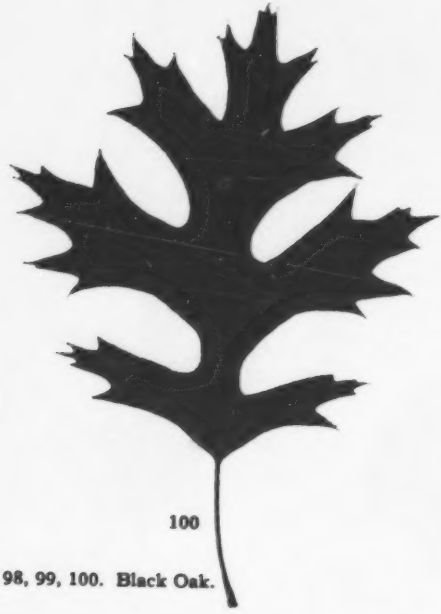
94

92, 93, 94. Bur Oak.

(Leaves one-half; fruits natural size).



95, 96, 97. Red Oak.



98, 99, 100. Black Oak.

101, 102. Pin Oak.

(Leaves one-half; fruits natural size).

In contrast to the preceding, the Black Oak leaf is as a rule 5- or 7-lobed; it is more deeply lobed, the longest lobes being generally 2 or more times as long as the narrowest middle portion of the leaf across between notches; and the bottoms of the notches of the central area of the leaf are very rounded and full, not as pointed as in Red Oak. The Black Oak is the most variable of our oaks in its leaves, but the preceding points will always apply. Figs. 98 and 100 show two common types.

FRUIT.—The fruits of the three members of this group are at once set apart from those of the remaining species of oak by the scales which form the acorn cup being thin and papery. Another difference is that the fruit takes two seasons to reach its full size, so that immature one-year-old acorns can usually be found on the tree, similar to those to be seen near the base of the twig in Fig. 210.

The fruits of the three species differ mainly in the characteristics of their cups.

The fruit of Pin Oak averages the smallest among our oaks, ½ inch being about the maximum length. The acorn is globular and rests in a very fine-sealed and shallow saucer-shaped cup (Fig. 101).

The Black Oak fruit shows a great range of size, but the cup is always quite deep and usually covers half the acorn. The cup is mostly hemispherical in shape. The scales are a pale chestnut colour and coated with fine, whitish hairs (Fig. 99).

The Red Oak fruit averages larger than that of either the Pin or Black Oak. The scales of the cup are a lustrous chestnut-brown, and not coated with hairs as in the Black Oak; often in the early part of the autumn they show a coating of gray wool, but this gradually weathers off. The cup is hemispherical in shape and about ⅓ of the nut is enclosed (Fig. 97). There occurs also the form of Red Oak with quite large acorns for the species, these in shallow, saucer-shaped cups which cover only the base of the acorn (Fig. 96).

BARK.—The bark on the older trees of this group is dark and firmly ridged, not scaly as in the other two groups.

That of the Black Oak is very rough, being broken by deep furrows into thick ridges; these in turn are divided by cross fissures, thus giving an appearance of irregular block-like strips. The bark is roughened at the base in quite young trees.

In Red Oak the bark is grooved by shallow furrows into rather regular, long, coarse, flat-topped ridges; the latter are not broken across to any great extent except at the very base of the tree.

For an oak, the bark of Pin Oak is comparatively smooth, owing to the ridges being narrow and low. The main stem of the tree has the habit of continuing up through the crown instead of splitting up into a few main branches to a much greater degree in the Pin Oak than in our other species. The tree gets its name from the multitude of fine pin-like lateral branchlets filling the crown or because of loose knots in the lumber.

TWIG.—The twigs of these three oaks differ from those of the other six in that some of them on the tree will show one-year-old fruits (unless the tree be too young) as shown in Fig. 210. The buds on all three are sharp-pointed, a feature not true of our other oaks with the exception of two Chestnut Oaks. Identification in winter time is assisted by the fact that one may practically always procure leaves and cups on the tree.

In the Pin Oak the longest bud encountered reaches a maximum of about $^{3}/_{16}$ inch, averaging the smallest of the three species. The buds are conical-ovoid in shape, light chestnut-brown in colour and practically hairless on the surface (Fig. 212).

The bud of Red Oak is larger, less conical and more ovoid in shape than the Pin

Oak bud. It is usually a lustrous chestnut-brown colour, and very clean-looking except for some rusty-red hairs at the tip. Very rarely it shows a little pale woolliness at the apex (Fig. 210).

The Black Oak bud in turn averages slightly longer than that of the Red Oak, about $^3/_{16}$ inch. Its distinctive label is the covering of dirty-white, woolly hairs. The lower rows of bud-scales may be free from this (Fig. 211).

WHITE OAK GROUP

LEAF.—In these two oaks the lobes of the leaf and their teeth are blunt and not bristle-tipped, not sharp and provided with bristles as in the members of the preceding group.

The White Oak leaf is usually cut obliquely into 5 to 9 rather oblong lobes. Figs. 87 and 89 show the commonest shapes. No matter what the shape, it can be told definitely from the leaves on a Bur Oak by the fact that there are no hairs on the under surface.

The foliage of Bur Oak is invariably finely downy beneath. The leaf is generally broadest towards its tip, with a very large terminal lobe which is cleft, giving a finger-ends-like appearance (Fig. 92). In the case of some leaves this distinctive terminal lobe is absent, and the leaf then resembles that of White Oak more (Fig. 94); but the lobing is never so symmetrical, the lobes are more rounded, with less of the oblong outline, and the leaf is downy below.

FRUIT.—Unlike the fruits of the Black Oak Group, the acorn cup-scales in the White Oak Group are thick and woody in texture, and knobby at the base of the cup. Moreover, the fruits mature the first season.

The fruit of the Bur Oak averages much larger than that of the White, and the tips of the cup scales are prolonged into a distinct awn-like point. This is especially noticeable with the uppermost rows of scales, where the awns form a sort of fringe around the margin of the cup, giving rise to the name of Mossy-cup Oak (Fig. 93).

It may be stated here that the fruits of any species of oak may be sessile or stalked. In the Swamp White Oak a very long stalk is generally present (Fig. 82). Long stalks are infrequently present in White Oak (Fig. 88). They are rare occurrences with our other oaks.

BARK.—The bark in the case of members of the White Oak Group is pale grayish in colour and scaly in character, the outer layers detaching readily. In the Bur Oak it is darker in colour and of a much heavier type on the branches than in the White Oak, with a tendency to form rough, corky ridges.

TWIG.—The twigs of Bur Oak are stouter and lighter in colour than those of White Oak. They are usually yellowish- or grayish-brown, while those of White Oak have mostly a reddish tint.

The buds of the two are very different. In the White Oak they are rounded-ovoid in shape, blunt, reddish-brown, have a maximum length of $^3/_{16}$ inch, and occasionally show a little hairiness. The buds along the sides of the twig mostly point away at a considerable angle (Fig. 213).

The Bur Oak bud (Fig. 214) on the whole averages shorter than that of the White Oak, and stouter in proportion to its length. The colour is masked by a coating of pale wool. The lateral buds mostly stand up against the sides of the twig, and are much less divergent than in the White Oak. At the tips of twigs one often sees long, downy, thread-like affairs (persistent stiples).

CHESTNUT OAK GROUP

This includes Swamp White Oak, Chestnut or Chinquapin Oak, Rock Chestnut Oak, and Dwarf Chinquapin or Dwarf Chestnut Oak. They belong to the White Oak Group as regards essential characters but are described separately because of their characteristic foliage.

LEAF.—In these four trees the leaves are quite unoak-like in that they are merely toothed rather than lobed. As in the White Oak Group, however, the teeth are not bristle-tipped.

The Swamp White Oak (Fig. 83) has a large obovate leaf with the margin varying from merely irregularly wavy-toothed to shallowly lobed. Leaves of the latter type may approach those of a Chestnut Oak in outline, but always lack the regularity and symmetry of margin present in the two Chestnut Oaks. The under surface of the leaf is hoary-white in colour and very velvety to the touch.

The leaves of Chestnut or Chinquapin Oak (Fig. 86) recall those of the true Chestnut (Castanea, Fig. 77) with their straight venation and regular pointed teeth. Those of Rock Chestnut Oak are similar but with rounded teeth.

Dwarf Chinquapin or Dwarf Chestnut Oak has a very small leaf about 3 inches long, looking like a miniature Chestnut Oak leaf with about half as many (around 7) pairs of lateral veins, and rather less regular toothing (Fig. 90).

FRUIT.—As in the White Oak Group the fruit cup of these has thick, woody, knobby scales. The acorns ripen in one summer.

The cup of the Swamp White Oak is very generally long-stalked, open saucer-like in shape, and the uppermost scales may form a fringed border (Fig. 82).

The cup in the two Chestnut Oaks is distinctly cup-like, with the scales only slightly knobby, and generally covering half the acorn (Fig. 85). It resembles the cup of White Oak, but in the latter only ⅓ of the acorn is covered as a rule. These three oaks cannot be separated with certainty by their fruits.

The Dwarf Chinquapin Oak is noted for the abundance of its fruit crops. The fruit is about as broad as long (Fig. 91). The species never reaches tree size.

BARK.—The Chestnut Oak Group, except Rock Chestnut Oak, has bark of the same type as that of the White Oak Group — pale in colour, and flaky. In Rock Chestnut Oak the bark is dark brown in colour and deeply and coarsely furrowed but somewhat flaky.

The bark on the branches of Swamp White Oak peels away somewhat as in Sycamore. This feature, with the numerous, scraggly, small branches of the crown, gives a rough unkempt appearance to the tree in winter.

TWIG.—The buds of Swamp White Oak resemble those of White Oak. However, they are brown rather than reddish-brown and are smaller, broader and blunter. About ⅛ inch is the greatest length. They are nearly as free from hairs (Fig. 215).

The Chestnut or Chinquapin Oak bud reaches a length of $^3/_{10}$ inch, and has the rather sharp, ovoid, conical shape of the buds of the Black Oak Group. It is a clean chestnut-brown colour (Fig 216). The bud of Rock Chestnut Oak is similar but averages longer, ¼ to ⅓ inch, and is finely hairy.

The Dwarf Chinquapin Oak has the smallest buds of any of the oaks. They are spherical to rounded-ovoid in shape. The twigs are quite slender and mostly light-coloured (Fig. 209).

For decorative purposes, the native species of oak are used mostly. Two European species, English Oak and Durmast Oak, and varieties of them are occasionally planted. They are easily separated by their leaves and fruit.

The ENGLISH OAK *(Q. robur L.)*, in previous editions named Pedunculate English Oak *(Q. pedunculata Ehrh.)*, has an obovate-shaped leaf with four to six pairs of irregular, rounded lobes which are mostly without teeth. The lobing is not so deep as in our native White Oak, and the leaf-stalk is short, usually less than ¼ inch. The recognition feature is that its base ends in two small, ear-like projections alongside the leaf-stalk.

The DURMAST OAK *(Q. petraea (Mattuschka) Liebl.)*, named Sessile English Oak *(Q. sessiliflora Salisb.)*, in previous editions, has a leaf similar in shape and lobing, but more symmetrical, and without the basal ear-like projections; the petiole is long, ½ to 1 inch.

The fruit of these two European oaks exceeds that of our native White Oak in size. The acorn is cylindrical and at least an inch long. The cup is deep saucer-shaped, with woody scales of the White Oak type. The individual cup is without a stalk, but placed on a common fruiting stalk which in the English Oak is from 1 to 6 inches long, and in the Durmast Oak is quite short.

THE ELM FAMILY
ULMACEAE

This family includes the genera, *Ulmus* and *Celtis*.

THE ELMS
ULMUS

White Elm *Ulmus americana L.*
Rock or **Cork Elm** *Ulmus thomassi Sarg. (syn. U. racemosa Thomas)*
Slippery or **Red Elm** *Ulmus rubra Mühl. (syn. U. fulva Michx.)*

Of the three species that occur in Ontario, the commonest and largest is the White Elm, so well known by its characertistic and graceful branching habit; it is found throughout the province except in the extreme north. Its numbers have been greatly reduced since the introduction of the Dutch Elm disease, but White Elm is a prolific bearer of seed, that produces sturdy and aggresive seedlings, and it is unlikely that it will suffer the same fate as the Chestnut *(Castanea)* did, following the introduction of the Chestnut blight. The Dutch Elm disease attacks all three native species of elm.

The Rock Elm is a smaller tree, with the trunk generally carried up into the crown without the early forking so usual in the White Elm; it is sparingly found in southern Ontario. The Slippery Elm is the smallest of the three species; it extends slightly farther north than the Rock Elm.

Elm is used for almost every purpose for which a cheap hardwood can be used, and is distinctive in having a large local use. The bulk of the elm cut is White Elm, though Rock Elm wood is superior in strength, hardness and toughness. The wood of the Slippery Elm is the poorest of the three species.

LEAF.—The leaves of all three elms are in general oval-shaped, strongly straight-veined, and coarsley doubly serrate (Figs. 103, 105, 107). They are 4 or 5 inches

ng in White Elm, and average slightly smaller in Rock Elm, and somewhat larger in ippery Elm.

The leaf of the Rock Elm is of thicker texture, darker green and more shiny than at of the others. It is perfectly smooth on the upper surface, while the leaf of Slippery lm is usually rough to the fingers like fine sandpaper, due to the presence of sharp rojections pointing towards the tip of the leaf; the upper surface of the White Elm is mooth or slight rough. There is, however, much variation in the feature of roughness n the latter two species.

The venation of elm leaves assists in their separation. In the Rock Elm, the lateral veins are plainly closer together, averaging about 6 to the inch of midrib, whereas in the other two there are about 4 to the inch. This refers to medium-sized leaves and the central portion of the midrib.

A Rock Elm leaf rarely shows any of the main lateral veins forking as they approach the edge of the leaf; a White Elm leaf seldom more than one or two pairs forking; while forking is very common in Slippery Elm.

The leaves of Slippery Elm generally have a sweet hay scent when dry.

FLOWER.—The elms flower very early in the spring, and the fruit is mature and falling by the time the leaves are fully grown. Unlike the previously described trees both stamens and carpels are in the same flower (perfect) (Fig. 113). The flowers (and fruit) are in clusters, in the case of Slippery Elm being very short-stalked, in the other species having relatively long, slender stalks. The cluster is raceme-like in Rock Elm.

FRUIT.—The fruit is small and flat with a broad wing surrounding the central seed; its characteristics and the method of arrangement in the cluster afford the surest identification means with elms.

The fruits of White and Rock Elm are oval, while those of Slippery Elm are almost circular in outline. In the White Elm fruit there is a deep notch at the top, the notch in the other two is slight.

The fruit of the White Elm is hairless except for a marginal fringe of long white hairs; that of Rock Elm is very similar except for a slight pubescence all over, in addition to the fringe; in the Slippery Elm the only hairs are on the central cavity containing the seed.

The White Elm fruit measures about ¼ inch across when fully developed; that of Slippery Elm about ½ inch; with that of Rock Elm intermediate in size (Figs. 104, 106, 108).

BARK.—The bark of the elms is grayish or reddish-brown, divided by irregular fissures into rather firm, somewhat flat-topped ridges. In White Elm and Rock Elm the outer bark shows layers of a whitish-buff colour alternating with dark patches when broken across. As the bark flakes off with weathering whitish and dark areas are exposed and the bark takes on an uneven ashy-gray colour. The bark of Red Elm, when broken across, does not show different coloured layers and is a uniform dark, reddish-brown colour. Rock Elm differs from the other two species in developing thick, corky ridges on the branches, in this similar to Bur Oak.

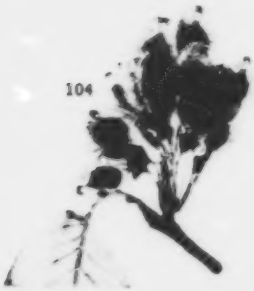
TWIG.—The leaf-scars although small are conspicuous, on account of their light colour. They are in 2 rows along the twig, semi-circular in outline, and generally show 3 sunken bundle-scars.

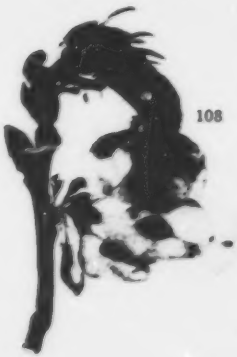
The buds towards the end of the twig are always the smaller, being leaf-buds. The flower-buds are much stouter and are to be found farther back on the twig (Fig.

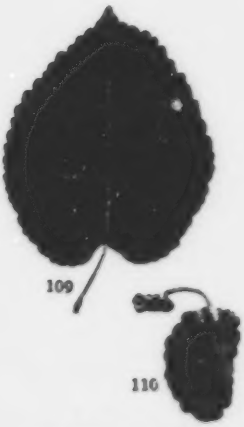
103, 104. White Elm.

105, 106. Rock Elm.

107, 108. Red Elm.







109, 110. Red Mulberry.

111, 112. Hackberry.

113. White Elm Flowers.

(Leaves one-half; others natural size).

7). This, and the arrangement of the bud-scales in 2 rows up the bud, afford good cognition features.

In White Elm the lateral buds are about $^3/_{16}$ inch in length, sharp-pointed, light ddish-brown, and clean-looking. They are ovoid but slightly flattened, and generally ınd close to the twig (Fig. 217).

The bud of Rock Elm is almost indistinguishable from the preceding, but is more ıarply tipped, diverges away from the twig and so is more conical and less flattened. ;t is generally more clearly hairy (Fig. 218).

Slippery Elm buds are readily told by their dark brown colour, bluntish ends, and the coating of long, rusty hairs especially at the tips (Fig. 219). The buds of the other two species may be somewhat minutely rusty-hairy. The inner bark of Slippery Elm twigs when chewed becomes a very slippery, mucilaginous mass in the mouth — an infallible test among the native species (Scotch Elm also has a mucilaginous inner bark).

Our native elms are mostly used in street and park planting, but the ENGLISH ELM *(U. procera Salisb.) (syn. U. campestris L.)* and SCOTCH ELM *(U. glabra Huds.) (syn. U. montana Stokes)* also enter into this class of material.

The SCOTCH ELM leaf resembles that of Slippery Elm. It is 3 to 5 inches long, often lobed at the apex, with a petiole not over ⅛ inch, shows numerous forking veins and is harshly rough on top. For satisfactory identification the fruit is necessary. It is 1 inch in diameter, completely free from hairiness, and has the seed in the centre.

The ENGLISH ELM has a much smaller leaf, only 2 or 3 inches long, and a petiole of nearly ¼ inch. Its fruit is about ½ inch across, hairless, with the seed chamber above the centre and practically touching the base of the notch. It is largely infertile.

The nursery distribution under the name of English Elm includes more than one species and also hybrid seedlings; some forms with corky ridges on the branchlets, similar to Rock Elm.

Hackberry *Celtis occidentalis L.*

The Hackberry is a medium-sized tree with somewhat the aspect of an elm, belonging to our Southern Hardwoods type, but, peculiarly enough, is to be found as a few specimens locally at widely separated stations much farther north.

LEAF.—The tree is characterized by the great variability of the leaves both in shape and size. The leaf (Fig. 111) is usually bluish-green rather than green, both above and below, broadly-ovate to lanceolate-elliptic, 4 inches or more long, with the margin serrate except at the oblique base. The identifying feature of the leaf is the type of venation. The lateral veins make a very acute angle with the midrib and curve upwards toward the apex of the leaf; while the lowermost one on either side by usually coming off below the base of the leaf gives an impression of a leaf-stalk forked into three. The narrower leaves resemble considerably those of a wild nettle, and the tree is frequently known as the Nettle-Tree.

FRUIT.—The fruit looks like a small cherry, dark reddish-purple when fully ripe, $^5/_{16}$ inch in diameter, with a stalk about ¾ inch long (Fig. 112). It is edible, but thin-fleshed; when the flesh is cleaned off well the stone is seen to be pitted into an elaborate, raised tracery. The fruits occur usually singly in the axils of the leaves,

are not ripe till autumn, and hang on more or less through the winter. Hackberry i a corruption of hagberry, a Scotch name for the European bird cherry.

BARK.—The bark is at times smooth, but is roughened usually by edges curlin outwards into narrow projecting ridges. The roughness is sometimes wart-like.

TWIG.—The twigs (Fig. 220) are slender, shiny brownish or dull downy-gray The pith is not solid, but shows cavities or chambers alternating with partitions, as i Butternut and Walnut (Fig. 255).

The leaf-scars are in 2 rows, small, semi-oval, and usually show 3 bundle-scars. At times the latter are joined.

The buds sit on a prominent projection, tightly flattened against the twig and are often malformed. They are about $^3/_{16}$ inch long, downy chestnut-brown, ovoid, and sharp. The bud-scales are in 2 rows, 2 to 5 in number, but usually 3 or 4 visible.

THE MULBERRY FAMILY
MORACEAE

This family is represented in Ontario by two genera: *Morus* and *Maclura.*

The Osage Orange is not native in the province but has become naturalized in some localities.

All species in the family produce a milky sap; this is unusual with most of our trees.

Red Mulberry *Morus rubra L.*

The Red Mulberry is a small tree which reaches its northern limit in the Lake Erie area. It is of no commercial importance.

LEAF.—Its leaves are ovate with a little tendency to be heart-shaped, about 4 inches long, coarsely serrate, and downy beneath (Fig. 109). They exhibit the same tendency to radiate (3 to 5) venation towards the base of the leaf as in the Hackberry already described. On young shoots the leaves are often lobed by one or more U-shaped, deep notches.

FRUIT.—The fruit is a dark reddish-purple, oblong aggregation about an inch long, recalling a blackberry (Fig. 110). It is sweet and edible.

BARK.—The bark is dark brown, divided into plates, tending to be flaky, and somewhat recalling that of Hop Hornbeam.

TWIG.—Mulberry twigs are light-coloured, have a sweetish taste, and exude a milky juice when cut (Fig. 221).

The leaf-scars are in 2 rows on prominent projections as in Hackberry. They are almost circular, hollowed out, and show numerous bundle-scars.

The end bud is ¼ inch long, the others smaller, brownish, smooth and shiny, ovoid, and sharp-pointed. The bud-scales are in 2 rows, with the margin of each scale darker than the rest of it.

The WHITE MULBERRY *(M. alba L.)* is planted in several ornamental forms (weeping, cut-leaved, etc.). It is a native of China, where it has been the basis of the

k-worm industry since the earliest times. Since, it has been introduced into the lediterranean region and eastward, and even into this continent for the same purpose.

It can be distinguished readily from the native forest species by the high lustre its leaves and the absence of down on the under surface. The fruit varies from hite to dark reddish.

The OSAGE ORANGE *(Maclura pomifera (Raf.) Schn.) (syn. Toxylon pomiferum Raf.)* is a native of the Osage region of Arkansas and westward which has been introduced as a hedge tree here and become naturalized occasionally. Despite its southern origin it is hardy in southern Ontario.

The leaf is shiny, ovate to elliptical in shape, abruptly narrowed to a long, conical, leaf-like point and the margin without teeth. The twigs are markedly zigzag with usually a strong thorn at each corner and below it a leaf.

The fruit is superficially like a green orange, 4 or 5 inches in diameter, and inedible. Since the two kinds of flowers are on separate speciments, fruit is produced only on certain trees. Fruit and twigs exude a milky juice when cut.

The wood is rich yellow in colour and noted for its hardness, heaviness, strength and durability.

THE MAGNOLIA FAMILY
MAGNOLIACEAE

This family includes the genera *Magnolia* and *Liriodendron*.

Cucumber Tree *Magnolia acuminata L.*

The Cucumber-Tree is found native occasionally in the Lake Erie area and planted specimens are often seen.

LEAF.—Its leaf is broadly-ovate to oblong-ovate with an abrupt, short point (acuminate) 5 to 9 inches long, the margin without teeth but frequently slightly undulating, strongly and widely pinnate-veined with these not reaching quite to the margin, thin in texture and greenish below (Fig. 114).

FLOWER.—The flowers are large, bell-shaped objects about 2 inches long, greenish-yellow and less showy than many of the other species of Magnolia.

FRUIT.—The fruit has a faint resemblance to a cucumber, when immature. At maturity it is a red, oblong-cylindrical body about 2½ inches long by 1 inch wide, made up of coalescent tough-fleshy pods (Fig. 115). These split open, each pod releasing 1 or 2 scarlet seeds suspended by a white thread made up of curious spiral filaments, which have the power of extension (Fig. 116).

BARK.—The bark is grayish-brown and furrowed into long, narrow, scaly ridges.

TWIG.—The twigs (Fig. 222) are stout, usually bright reddish-brown, and ringed by one line-like (stipule-) scar at each leaf-scar. This latter feature is found only in two others of our trees, the Sycamore and Tulip.

The leaf-scars are horseshoe-shaped areas around the bud, with a row of large bundle-scars.

The terminal bud is around ¾ inch long, the leaf-buds oblong and the flower-buds

long-ovoid. The characteristic of the buds is their dense coating of olive-gray, silky hairs.

Many species of Magnolia are favoured for ornamental use, especially the early-blooming varieties whose flowers precede the leaves. These latter are Chinese or Japanese species or their hybrids. The most popular in Ontario seems to be the hybrid M. soulangeana with rose-coloured flowers.

Tulip *Liriodendron tulipifera L.*

This species is scattered through the Southern Hardwoods type in Old Ontario. It is a large and valuable timber tree producing soft, easily-worked lumber, replacing basswood in many uses. The native supply was always insignificant. The lumber is usually called Yellow Poplar or Whitewood.

LEAF.—The leaf is of a very striking shape, having 2 (usually) large lobes towards the base, and 2 others at the top separated by a shallow notch making it look as if the end of the leaf had been cut off (Fig. 117).

FLOWER.—The flower is a beautiful and rather showy one, a greenish-yellow cup suffused with orange inside towards the base, about 2 inches deep (Fig. 120). Both parts of the scientific name refer to the flower.

FRUIT.—The fruits are strap-shaped, 1 inch in length, and arranged in a closely overlapping manner on a central axis to form a spindle-shaped aggregate 2½ inches long (Fig. 119). The bulk of each fruit is a narrow flat wing, with a small, 4-ridged, woody cell at the bottom containing 1 or 2 seeds (Fig. 118).

BARK.—The bark is regularly and clearly furrowed into long, rounded ridges.

TWIG.—The twigs (Fig. 223) are brownish, shiny, and ringed characteristically with stipule-scars at each leaf-scar as in the Magnolia. The pith, though solid, is barred across at intervals with hard partitions of a different colour (Fig. 254).

The leaf-scar is nearly circular, and the numerous scattered bundle-scars in it give a sieve-like appearance.

The terminal bud is around ½ inch long, dark reddish-brown, flattened, with two external spoon-shaped scales face to face. It is generally duller looking than the twigs, with usually a slight bloom and scattered white dots over the surface.

Papaw

Asimina triloba Dunal

This is small tree with about the same range as the Tulip-Tree. It is a member of the custard-apple family, Annonaceae.

LEAF.—Its leaf is a characteristic obovate-lanceolate shape uniformly narrowed to the base, varying greatly in size from a few inches to a foot long, thin, no teeth on the margin and prominent, pinnate, rusty veins (Fig. 121).

FLOWER.—The flowers are reddish-purple, 1½ inches across.

114

115

116

117

118

119

114, 115, 116. Cucumber Tree.

117, 118, 119. Tulip Tree.

(Leaves one-half; others natural size).

120. Tulip Tree.

123

121

122

121, 122. Papaw.

124

126

125

123, 124, 125, 126. Sassafras.

(Leaves one-half: others natural size).

FRUIT.—The fruit is fleshy, greenish-yellow turning dark when ripe, sweet and ıscious to eat. It varies much in shape and size, commonly oblong-cylindric and about inches long, but frequently globose and at times curved. Imbedded in the pulp are ırge, brownish seeds of varying shape and size, but usually flattish (Fig. 122).

BARK.—The bark is dark brown and slightly scaly.

TWIG.—The twigs (Fig. 224) are brownish and curiously streaked with fine, white, line-like grooves. The pith is solid, but barred across by hard partitions at emote intervals (Fig. 254).

Sassafras

Sassafras albidum (Nutt.) Nees (syn. S. variifolium (Salish.) Ktze.)

This is another southern species, reaching as far north as Toronto. It is a medium-sized to small tree with the crown usually an intricate maze of abrupt-angled branch-lets. Foliage, twigs and roots are strongly aromatic to the smell when bruised, and spicy-mucilaginous when chewed, this making identification easy and positive.

Sassafras is a member of the laurel family, Lauraceae.

LEAF.—The leaf is oval, without teeth on the margin, with the main lateral veins wandering off irregularly from the midrib at remote intervals and curving strongly towards the apex of the leaf; along the margin they form a closed loop-like system. Besides this type of leaf one encounters leaves deeply 1- to 3-lobed, often all kinds on the one branch, hence the name variifolium (Figs. 123, 124, 125).

FLOWER.—The greenish-yellow flowers appear in raceme-like clusters as the leaves are unfolding, the two kinds on different trees usually.

FRUIT.—The fruit is a small, ovoid, dark blue, berry-like one, containing a large brown stone. It is placed in the top of a reddish stalk about 1½ inches long which is gradually enlarged into a club-shaped end with a 6-notched collar (calyx) around the base of the fleshy part (Fig. 126).

BARK.—The bark is dark reddish-brown, deeply fissured into heavy, flattish, corky ridges which can be cut very readily. Frequently there are transverse crack-like fissures ringing the trunk more or less and dividing the ridges into block-like segments. The roughness of the bark appears very early in the life of the tree.

TWIG.—The twigs are mostly greenish, occasionally dark purplish, often glossy, and very brittle. The most of them will show long, slender, lateral branchlets longer than the leading twig (Fig. 225).

The leaf-scar is semicircular with one dash-like bundle-scar.

The buds have the same characteristic colour as the twigs.

Witch-Hazel

Hamamelis virginiana L.

Witch-Hazel belongs in the family Hamamelidaceae. It attains its best development in the southern Alleghanies where it reaches diameters up to 12 inches. With

us it occurs scattered through the hardwood forest of Old Ontario as a small tree or large shrub.

LEAF.—The leaf is 4 or 5 inches long, roundish-obovate, strikingly oblique on one side at the base, very thin in texture, and irregularly, large wavy-toothed towards the apex and teeth much smaller or reduced to a mere waviness towards the base. The primary veins are conspicuous widely spaced and ascend sharply (Fig. 134).

FLOWER.—The Witch-Hazel is unique among our forest trees in that it blossoms in the autumn. The flowers, generally in clusters of three, with their bright, yellow, ribbon-like petals add much charm to woods in October days.

FRUIT.—The fruit is mature the following season when the trees are again in flower. It is a 2-beaked, woody pod ½ inch long, grayish-buff in colour, ringed about the centre with a prominent rim (calyx), and usually found in pairs. When the pod splits back, two, shiny, black, very slippery seeds are shot out, the pod itself persisting on the tree for nearly a year afterwards (Fig. 135).

BARK.—The bark is smooth or finely scaly, sometimes mottled, the inner bark reddish-purple.

TWIG.—The twig is slender and yellowish in colour (Fig. 226).

The leaf-scar varies around a semicircular shape and shows 3 group-like light-coloured bundle-scars. The scars of the stipules are very distinct as two triangular areas, one on either side of the leaf-scar and some distance away from it.

The buds are stalked and are not of the usual scaly type. The terminal bud is about ½ inch long, slender, flattish, slightly curved, and densely covered with yellowish-brown hairs. Some of the lateral buds are very small, and frequently there is more than one bud at a leaf-scar.

Sycamore

Platanus occidentalis L.

This is the most massive of our southern hardwoods, but occurs sparingly in southern Ontario. It is also known as Buttonwood and Plane-Tree, and belongs in the family Platanaceae. The name Sycamore is applied to one of our commonly planted European maples, also.

LEAF.—This tree has large leaves, most of them over 5 inches broad and nearly as long (Fig. 127). The leaf reminds one of that of a maple in general shape and nervation. It is rather indistinctly 3- or 5-lobed, each lobe mostly wavy-toothed. It is readily distinguished from a maple leaf by the arrangement not being opposite in pairs, and by the end of the leaf-stalk being funnel-like.

FRUIT.—The fruits form a ball about 1 inch in diameter, usually only one hanging at the end of a long stalk (Fig. 128). The ball is made up of innumerable, small, elongated nutlets each provided with a basal ring of tawny hairs spreading stiffly apart (Fig. 129). The fruits persist on the tree throughout the winter, gradually going to pieces.

BARK.—The bark is smooth except towards the butt of the tree. It is dull reddish-brown, constantly flaking off in large, irregular, thin, brittle plates and exposing the

127, 128. 129. Sycamore.

130, 131. Wild Crab.

132, 133. June-Berry.

134, 135. Witch-Hazel.

(Leaves one-half; fig. 133 three-quarters; others natural size).

inner greenish-yellow bark which fades whitish. The resultant mottled patchwork is very striking.

TWIG.—The twigs (Fig. 227) are orange-brown. Around the twig at the top of each leaf-scar is to be seen a line-like (stipule-) scar, as in Magnolia and Tulip.

The leaf-scar is in the form of a narrow band with undulating edges, and almost encircling the bud. There is a row of bundle-scars tending to be somewhat grouped at the wider parts of the leaf-scar.

The bud is bluntly conical, dark reddish-brown, lustrous, ¼ inch long, and shows one cap-like scale. It is hidden in the funnel-like end of the leaf-stalk, and not visible till after leaf-fall.

The Sycamore usually planted is the LONDON PLANE or MAPLE-LEAVED PLANE *(P. acerifolia (Ait.) Willd.)*, supposed to be a hybrid between our tree and the Oriental Plane, and generally sold as the latter. It is told from our native species by the deeper lobing of the leaf which makes it much more maple-like with the terminal lobe at least as long as broad. The ball-like fruits are seldom solitary on the stalk, and the hairs on the nutlet are not confined to its base.

THE ROSE FAMILY
ROSACEAE

This is a very large family of plants containing herbaceous representatives, shrubs and trees. It is a family of great importance to man, furnishing many palatable temperate fruits, and ornamental shrubs. Among the former may be mentioned the raspberries, blackberries, strawberries, apples, pears, plums, cherries, peaches, quince and apricot. In the ornamental class the most commonly used are the roses and spireas, but some of the preceding group also have decorative value.

Of native forest species there are tree representatives in the genera Prunus, Amelanchier, Malus, Sorbus and Crataegus. Of these, however, only the Black Cherry is of timber importance.

The species of Crataegus or Hawthorns are not described in this bulletin. They have no economic value, in fact are tree weeds, and their separation is extremely difficult. The species are closely related in the different groups, "best distinguished by the number of stamens and colour of their anthers." When one considers that over one-fifth of the trees described in Sargent's Manual are arborescent hawthorns — more than the total tree flora of Canada — the present-day treatment of the group must be considered provisional.

THE CHERRIES AND PLUMS
PRUNUS

Black Cherry *Prunus serotina Ehrh.*
Choke Cherry *Prunus virginiana L.*
Red Cherry *Prunus pensylvanica L.*
Canada Plum *Prunus nigra Ait.*
Wild Plum *Prunus americana Marsh.*

The three forest species of cherry are all found throughout most of the province. The Red Cherry is also known as Bird, Pin and Fire Cherry. The Black Cherry is a

ırge tree, yielding a very valuable wood for furniture, but occuring only as scattered rees; the other two species seldom exceed 6 or 8 inches in diameter.

The Canada Plum is a small, straggling tree, occurring throughout the province xcept in the extreme north.

The Wild Plum is a quite similar tree in the most southerly part of the province. It nay be told from the Canada Plum by its narrower, more sharply toothed leaves and globular, more reddish fruit; it is not included in the descriptions below.

In addition one occasionally encounters seedling cherries and plums which have originated from fruit of the cultivated forms. Most of the latter are of foreign origin, but some varieties of cultivated plum have been developed from the Canada Plum.

The species of Prunus may be discussed together in a comparative way.

LEAF.—The leaf of the Red Cherry is the narrowest in ratio to length of the four species. It averages 3 or 4 inches long by 1 inch in width. It is oblong-lanceolate with a long tapering point often curved to one side. It is very thin, and green underneath. The marginal teeth are very distinctive, being very small and irregular with roughly two sizes alternating, looking much as if the edge had been gnawed by small teeth (Fig. 136).

The leaf of the Black Cherry is oval in shape, measuring about 4 inches by 1½ inches, and is at once distinguished from the other cherries by its thick leathery texture and the type of teeth. These are serrate with one side of the tooth very long, and the tips are mostly rounded; this gives an appearance of a succession of beaks pointing towards the apex when the margin is viewed across the sky as a background (Fig. 137).

In the Choke Cherry we find a thin leaf with an abrupt short tip, and broadly oval in shape — much broader in proportion to its length than the Black Cherry leaf. It is the only cherry leaf with fine and very sharp teeth (Fig. 138). It resembles the leaf of the June-Berry (Fig. 132), but is seldom so rounded at the base.

The Canada Plum leaf is usually obovate, 4 inches long, doubly toothed with prominent rounded teeth. It is narrowed suddenly into a long point — a good identification mark (Fig. 139).

FLOWER.—These are in clusters, there being two distinct types in the group (Figs. 143, 144). In the Black and Choke Cherries the individual flowers are short-stalked (¼ inch) and a large number are arranged along a common axis (raceme) at the end of the young shoot newly emerged from the bud.

In the Red Cherry and Canada Plum the flowers are long-stalked (¾ inch) with a small number originating nearly from one place to form the cluster; the clusters arise in the axils of the leaves, and with several such close to one another along the stem the whole impression is of one large open cluster. The Canada Plum produces about 3 flowers from a bud, the Red Cherry 5 to 7.

The flowers of all are white. Naturally, from the location of the flowers, the Choke Cherry and Black Cherry are latest in blooming and with the leaves largely developed. The other two are in full flower by the time the leaves are half-grown. The order of flowering is Canada Plum, Red Cherry, Choke Cherry, Black Cherry.

FRUIT.—The fruits are in clusters corresponding to the types of flower cluster described above.

The Canada Plum is orange-red, oblong-oval, 1 inch long, has a large stone and is sour to eat (Fig. 141).

The Red Cherry is light red in colour, ¼ inch in diameter, with a thin sour flesh (Fig. 140).

The Black and Choke Cherries are crimson-black, ⅜ inch across, the former pleasant to taste but the latter rather astringent. The fruit of the Black Cherry has below it a conspicuous 5-angled collar (calyx) (Fig. 142); this is quite minute in the Choke Cherry.

BARK.—The bark of the Black Cherry on younger stems is reddish-brown and smooth, with conspicuous whitish elongated lenticels. As the tree grows larger it becomes broken into very characteristic, squarish, firm, blackish scales.

The bark of the Red Cherry is similar in colour to that of a young Black Cherry and smooth. The elongated lenticels are orange-coloured and powdery — a condition seen on a Black or Choke Cherry usually only if rubbed. When old, the bark of Red Cherry becomes only slightly roughened.

The Choke Cherry bark is distinguished by being a dull grayish-brown in colour, not reddish, and the lenticels elongated very little. A series of them in line, however, superficially looks like a single one much elongated, as in the Black and Red Cherries. In old age the bark becomes blackish and somewhat roughened.

The bark of the Canada Plum is quite black, with the lenticels only slightly elongated. It splits longitudinally and curls back somewhat in firm, thick plates, beneath which it is roughly scaly.

TWIG.—The inner bark of cherries and plums contains hydrocyanic acid which gives the twigs the distinctive taste and odour of bitter almonds —a good test. In addition, those of Choke Cherry have a rank, disagreeable odour.

The twigs of all four species (Figs. 230 to 233) are rather slender, with generally those of Red Cherry and Canada Plum the finest and those of Choke Cherry the coarsest. They are reddish-brown, with those of Choke Cherry more usually grayish-brown. All, with the exception of Choke Cherry, are covered with a grayish skin weathering off and easily rubbed off. The Canada Plum is characterized by the presence of thorns.

The leaf-scars are small, semi-oval, and contain 3 bundle-scars. They are arranged in more than 2 rows along the twig.

In general the buds of the Red Cherry average the smallest, followed by Black Cherry, and then Choke Cherry. Those of the Canada Plum vary considerably in length, but are usually shorter than Black Cherry buds. A grayish skin similar to that on the twigs, temporarily covering them, may occur on the buds, especially in the case of Red and Black Cherries.

In the Red Cherry the distinctive feature lies in that we find the buds clustered frequently at the ends of the long shoots as well as at the ends of the short, lateral, fruiting spurs; while in the other three species, clustered buds are infrequent. They are bright reddish-brown, rounded-ovoid and blunt. The buds are so small it is difficult to make out the separate scales without a lens, being generally under ⅛ inch long (Fig. 230).

The buds of the Black Cherry are also reddish-brown, but not quite so blunt as in the Red Cherry, and average larger. They are of uniform colour or with the edges of the scales darker. About 4 scales are visible (Fig. 231).

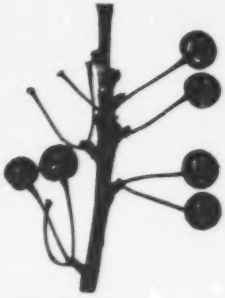
In the Choke Cherry the buds are a grayish-brown colour, conical, very sharp-pointed, with the tip generally slightly curved. The distinctive feature is the thin pale margin to the bud-scale contrasting strongly with the adjacent surface (Fig. 232).

136. Red Cherry.

137. Black Cherry.

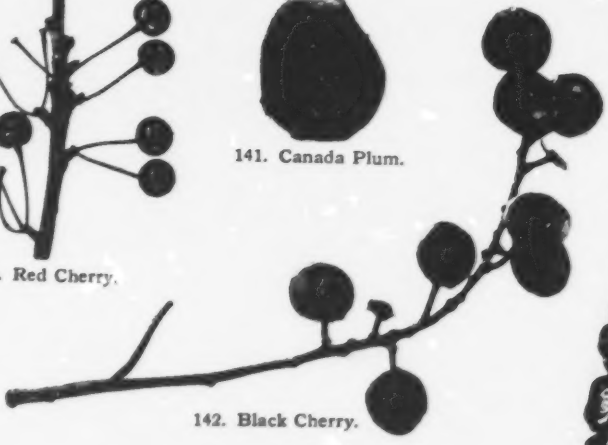
138. Choke Cherry.

139. Canada Plum.

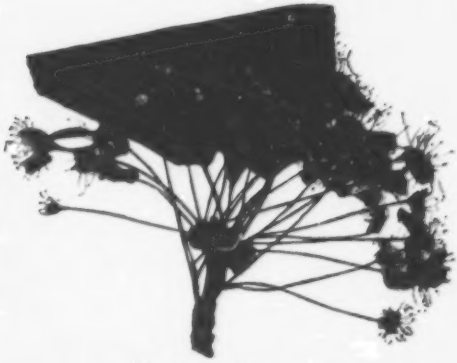


140. Red Cherry.

141. Canada Plum.



142. Black Cherry.



143. Red Cherry.

144. Choke Cherry.

(Leaves one-half; fig. 140 three-quarters; others natural size).

In the Canada Plum there is no true terminal bud as in the Cherries, as is shown by the small scar at the end of the twig. The bud is grayish-brown, conical, pointed with the margins of the scales thin and pale (Fig. 233).

June-Berry *Amelanchier arborea (Michx. f.) Fern.*

This is the only representative of the genus in Ontario which gets out of the shrub class. It is generally encountered as a small tree, but occasionally trunks are met with up to 18 inches in diameter. It is also known as Service-Berry and Shadbush. Several shrubby species of June-Berry occur in the province, some of them almost reaching small tree size.

LEAF.—The leaves are broadly oval, 2½ inches long and ear-marked by the margin being finely, sharply and regularly serrate (Fig. 132).

FLOWER.—It flowers very early in the spring when the leaves are about half-grown, and is a very ornamental tree with the crown a mass of white flowers.

FRUIT.—The fruit is a sweet, edible, dark-purplish berry with a slight bloom, ¼ inch in diameter on a stalk ¾ inch long and containing numerous seeds. The berries are arranged in raceme-like clusters. Despite the name they are not ripe until the end of July (Fig. 133).

BARK.—The bark is very characteristic and pleasing to the eye. As usually seen it is a smooth gray, streaked with narrower, contrasting, darker areas; eventually it becomes lightly ridged and scaly.

TWIG.—The twigs of June-Berry are very fine, reddish-brown, with a pith which is 5-sided in cross section (Fig. 234).

The leaf-scar is narrowly crescentic, with 3 unusually large bundle-scars. Usually two ridges run longitudinally from either side of the leaf-scar.

The buds at once identify the twig, being very slender, very sharp-pointed, closely pressed against the twig, and with the tip often curved. They are ½ inch long, greenish-brown at first and eventually reddish-brown. In shape they recall those of the Beech, but the latter average much larger, with at least twice the number of bud-scales, are chestnut-brown in colour, and stand off almost at a right-angle to the twig. Beech twigs also are much coarser and almost ringed with the stipule-scars at each leaf-scar.

Wild Crab *Malus coronaria (L.) Mill. (syn. M. glaucescens Rehd.)*

The Wild Crab is a small tree found rather infrequently throughout southern peninsular Ontario. It is a native forest species not to be confused with seedlings of cultivated origin from seeds accidentally dropped in the wood.

LEAF.—The leaves are about 3½ inches long, mostly triangular-ovate in shape, with coarse serrate teeth, these much reduced in size toward the base of the leaf In addition the margin has a sharply notched appearance, most evident towards the base, the two lowermost notches often making the leaf practically 3-lobed — this most evident on vigorous shoots (Fig. 130).

FLOWER.—The flowers are of the showy apple type, white petals delicately streaked with pink, the open flower about 1½ inches across on a stalk 1¼ inches long. About 5 or 6 of these are arranged in each raceme-like cluster.

FRUIT.—The fruit is a greenish crab apple 1½ inches across, covered with a waxy wax, very hard, extremely sour, and persisting on the tree into winter (Fig. 131).

BARK.—The bark is reddish-brown with thin, flat, scaly ridges.

TWIG.—The twigs (Fig. 228) are reddish-brown with a grayish skin gradually weathering off, and as they grow older become somewhat armed with thorns.

The leaf-scar resembles very closely that of June-Berry.

The buds are bright red, elongated, blunt or sharp, up to ¼ inch long, and hairy; the lateral ones usually curved in against the stem.

Mountain-Ash *Sorbus americana Marsh.*

This is a small northern tree, with no commercial significance. It is not a true ash, and also goes under the name of Rowan-Tree and Service-Tree.

A form of Sorbus in the northerly part of its range in Ontario which bears shorter leaves with abruptly pointed leaflets and brilliant fruits, often ½ inch in diameter, has been recognized as a separate species: the Showy Mountain-Ash (S. decora (Sarg.) Schneid.). It is perhaps the most beautiful of the genus when in fruit but seldom attains tree size in Ontario. The description below applies to S. americana.

LEAF.—Its leaf is about 8 inches long and compound, being divided into 13 to 17 leaflets mostly. The leaflets are lanceolate, finely serrate except towards the base, and in pairs along the midrib except for the last leaflet at the end. Mountain Ash leaves show considerable variation, especially in the toothing on the margin. They resemble Sumach leaves slightly, but the twigs of the latter are densely, velvety hairy.

FLOWER.—The flowers are small and white, in large broad rather flat-topped showy clusters.

FRUIT.—The fruit is a similar cluster of orange-red, berry-like objects ¼ inch in diameter, acrid, and persisting in the tree unless removed by birds. It resembles that of the cultivated species.

BARK.—The bark is smooth, thin, light gray, and shows conspicuous widely separated lenticels.

TWIG.—The twigs (Fig. 229) are stout, dark reddish-brown with a grayish skin weathering off, with conspicuous lenticles. The wood discolours reddish rapidly after being cut.

The leaf-scar is narrow, crescentic, and placed obliquely on a prominent swelling. There are 5 bundle-scars, rarely fewer.

The terminal bud is ½ inch long, very dark reddish-brown, broadly conical sharp and often curved at the tip. Its most distinctive feature is its shiny gummy surface with a few scattered hairs.

The EUROPEAN MOUNTAIN-ASH *(S. aucuparia L.)*, in many horticultural forms and one hybrid *(S. hybrida L.)*, is often grown for ornament on account of the foliage and fruit colours in the autumn. The European species has rather oblong leaflets which are very short-pointed, not tapering. The fruit is bright red, larger than

in the native species, averaging ⅜ inch, and the cluster is not flattish, but rather round-topped. The bud is not gummy, but quite woolly, especially the upper half.

THE PEA FAMILY
LEGUMINOSAE

This is a very large family of plants characterized by a fruit like a pea pod, and usually pea-like flowers. It ranks next to the grasses in economic importance, containing such valuable plants as the pea, bean, peanut, the clovers and their allies. Many of our ornamental shrubs belong to this family.

Relatively few members of the family reach tree size. Of these and native to the province are the Honey Locust, Kentucky Coffee-Tree and Red-Bud. These have been reported only from the southwestern portion of the Lake Erie region but are frequently planted . In addition may be described the common Black Locust, though not native. The four species are of slight economic importance.

Honey Locust *Gleditsia triacanthos L.*

LEAF.—The leaves of this tree are compound, but with an even number of leaflets, usually unlike the Black Locust in this respect, and about 6 inches long (Fig. 149).

The leaflets average only half as long and half as broad as those of the Black Locust, are lanceolate-oblong in shape and faintly toothed on the margin. Frequently the leaves appear clustered on the older parts of the branches.

The leaves on the terminal shoots are usually doubly compound, that is to say, of a pattern that would result from the usual type of leaf if each leaflet were replaced by a whole compound leaf.

FLOWER.—The flowers are greenish, inconspicuous, arranged in racemes 3 inches long, and appear in early summer.

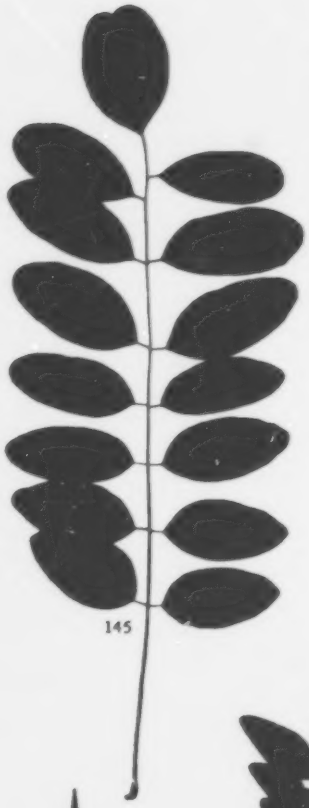
Fruit.—The fruit (Fig 151) is a shiny, dark brown, thin, flat pod, a foot or more in length by 1¼ inches broad, and generally in clusters of 2 or 3. As it approaches maturity and dries, the pod twists corkscrew-like. It does not remain on the tree as in the case of the Black Locust, nor does it split open. The seed is coffee-brown, oblong, flattish, about ⅜ inch long, and surrounded by thick pulp (Fig. 150).

BARK.—The bark is smooth with elongated lenticels or finally somewhat roughened.

TWIG.—The twigs (Fig. 235) are greenish to reddish-brown with a polished look, zigzag, and the branchlets usually bear strong spines removed somewhat above the leaf-scar. These spines may be branched, 2 shorter lateral ones on the main spine being commonly encountered, hence the specific name (Fig. 148). The spiny condition may extend over the larger limbs and even the trunk.

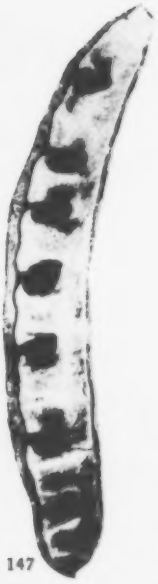
The leaf-scar is a narrow U-shaped band, considerably enlarged opposite the 3 bundle-scars.

The buds are minute, about 5 in a vertical row, and buried in the bark with the exception of the uppermost one or two.



145

146



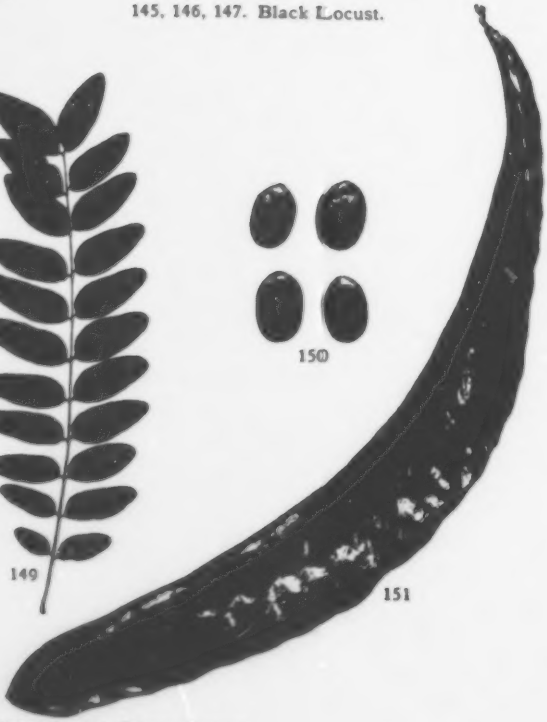
147

145, 146, 147. Black Locust.

148

149

150



151

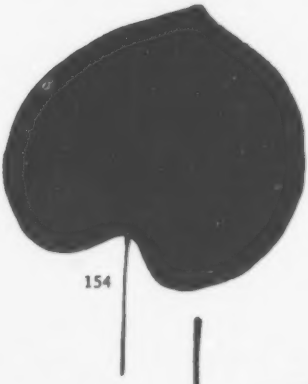
148, 149, 150, 151. Honey Locust.

(Figs. 145, 149, 151 one-half; others natural size).

152

152, 153. Coffee-Tree.

153

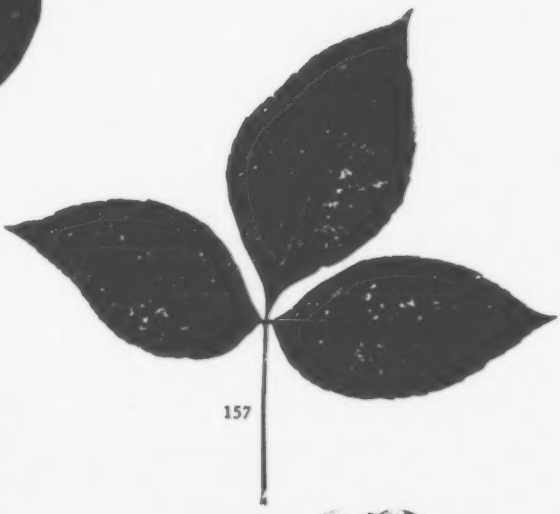


154

155

156

154, 155, 156. Red-Bud.



157

158

157, 158. Hop-Tree.

(Leaves one-half; others natural size).

entucky Coffee-Tree *Gymnocladus dioicus (L.) K. Koch*

This tree will be mostly met with as a planted specimen, it being hardy as far north Ottawa.

LEAF.—The tree is characterized by extremely large leaves, up to 3 feet in length nd 2 feet in width. The leaf is doubly or twice pinnate except at the base, where one nds one, and occasionally a second, pair of simple leaflets. The leaflets are ovate, ithout teeth, and average about 2 inches in length; they are seldom placed opposite ich other.

FLOWER.—The flowers are greenish and inconspicuous in large open clusters. Usually the two kinds are on different trees.

FRUIT.—The fruit is a hard, leathery, dark reddish-brown pod usually with a light bloom, on a very stout stalk 1¼ inches long. As met with here the pods are about 5 inches long and 1½ inches wide. The interior is filled with a sweet sticky pulp by which the seeds are separated. The seeds are blackish-brown, flattened ovoid, ¾ inch in length, with a very hard shell (Figs. 152, 153).

BARK.—The bark is grayish, with thin, firm, flaky ridges curling outwards on the edges.

TWIG.—The twigs identify the tree at once. They are so stout and blunt and so few in number that one's first impression is that the tree has been severely pruned. They are generally covered with a whitish crust-like layer and have a very large pinkish-brown pith (Fig. 237).

The leaf-scars are large, conspicuous, heart-shaped, whitish marks, and show 3 to 5 prominent bundle-scars.

The buds are minute, dome-shaped, blackish-silky bodies sunken in the bark and ringed around by it with a hairy rim. There are 2 or 3 buds in a line, the uppermost larger and placed considerably above the leaf-scar, while the lowermost occupies its notch.

Red-Bud *Cercis canadensis L.*

This is a small tree of no importance for its wood, but highly ornamental. It is also known as Judas-Tree.

LEAF.—The leaves are roundish heart-shaped, 3 to 5 inches in diameter, without teeth on the margin, with 5 to 7 prominent radiating veins (Fig. 154).

FLOWER.—When in bloom the tree is strikingly beautiful, with an abundance of red, partially pea-like flowers in small umbel-like clusters, in early spring usually before the leaves have unfolded.

FRUIT.—The fruit is a pinkish-brown pod much like that of the Black Locust. The seeds however are reddish-brown, shining, strongly flattened and nearly circular in outline (Figs. 155, 156).

BARK.—The bark is reddish-brown and scaly ridged.

TWIG.—The twigs (Fig. 238) are fairly slender, and dark reddish-brown.

The leaf-scar usually shows 3 large bundle-scars. Frequently 3 ridges run down from the leaf-scar, one from either corner and one from the middle of the outer edge.

The buds are dark purplish-red; the leaf-buds minute, rather circular, flattish

affairs; the flower-buds larger, bluntish, flattish globular or club-shaped. Often the buds are placed one above the other, the lowermost so small they are easily overlooked. An easy recognition feature is the occurrence of flower-buds in clusters below the branchlets — an unusual position.

The BLACK LOCUST *(Robinia pseudoacacia L.)* is a native of the slopes of the Appalachians of eastern United States, but has been planted so extensively in Ontario that is has become more or less naturalized.

LEAF.—The leaf is commonly about 9 inches long, compound with an odd number of leaflets, and with usually 2 small prickles (stipules) on the branch at the base of the leaf-stalk which itself is much enlarged. The leaflets are 1½ inches long, oval to oblong in shape, without teeth on the margin, and with stalks ¼ inch in length (Fig. 145).

FLOWER.—The flowers are pea-like, white, fragrant, appearing in large, showy, drooping clusters (racemes) in June.

FRUIT.—The fruit (Figs. 146, 147) is a thin, flat, light-brown pod with a narrow wing along the side where the seeds are attached, 4 inches long by ½ inch wide. The seeds are small, somewhat kidney-shaped and dull orange-brown in colour, but seem darker on account of splashes of black. The pods hang on the tree all winter.

BARK.—The bark is deeply furrowed into wavy irregular ridges, leaving the impression of being heavier than in most species at the same diameters.

TWIG.—The twigs are brownish, generally somewhat zigzag and angular-ridged (Fig. 236).

The leaf-scar is large, light-coloured and conspicuous on a prominent projection, roughly inversely triangular, and commonly flanked by a pair a prickles or spines. There are 3 prominent bundle-scars.

The buds exhibit unique and curious features. Three or four of them, minute and rusty-haired, are concealed in a cavity formed by the growth of the base of the leaf-stalk. This cavity is lined with rusty hairs also. When the leaf falls off in the autumn its scar forms a platform-like covering for the cavity. Consequently the buds are invisible until the approach of spring, when the leaf-scar cracks in a tri-radiate manner. As the new shoot emerges it bends the three lobes of the scar outwords, and they may be seen throughout the season at the base of the branch and still with their layer of rusty hairs.

THE RUE FAMILY
RUTACEAE

This family includes two species that sometimes reach tree size in Ontario: the Hop-Tree and the Prickly-Ash . Neither is important. Both occur naturally in the Deciduous Forest region, and Prickly-Ash extends eastward and north as far as Ottawa. The Hop-Tree is often planted as an ornamental tree throughout southern Ontario.

The foliage of both is unusual in being marked with innumerable translucent dots; in this, it is unlike all other native tree species.

rickly-Ash *Zanthoxylum americanum Mill.*

The Prickly-Ash is usually a shrub, seldom reaching a height of 25 feet.

The leaves are compound with 5 to 11 minutely toothed leaflets, dark green bove, lighter below, and finely hairy, especially on the veins, and usually bearing ome prickles on the leaf stalk. In this last feature, it differs from all other native ree species.

The branches are thorny, bearing short prickles in pairs, up to ½ inch long, ecalling those of the Black Locust. The twigs are finely hairy with scaly, fully exposed vinter buds.

Prickly-Ash does not appear in the keys in this book.

Hop-Tree *Ptelea trifoliata L.*

The Hop-Tree is a small tree, more often a shrub.

The leaf is compound, 4 or 5 inches long, consisting of three leaflets—these ovate, without stalks, and with faint marginal teeth; the terminal leaflet is the largest, and is more gradually and symmetrically narrowed to its base than the other two (Fig. 157).

The flowers are in greenish-white clusters.

The fruit recalls that of the elm. It is nearly circular, 1 inch across, with a central 2-seeded double chamber surrounded by a broad, tough, very veiny wing (Fig. 158). Frequently, only one seed develops. The fruits remain on the tree all winter in prominent, dense clusters in which the individual fruits hang down due to the long, curved stalks.

The bark is dark reddish-brown and smooth except for wart-like protuberances.

The twigs (Fig. 239) have conspicuous leaf-scars, which are rounded V-shaped bands with 3 bundle-scars.

The buds are small, somewhat globular, and covered with yellowish-white wool. They are partially sunken in the angle of the leaf-scar and so are not visible till after eaf- fall. Extra buds are to be found at the leaf-scars.

Here may be mentioned the TREE OF HEAVEN OR CHINESE SUMACH *(Ailanthus altissima (Mill.) Swingle) (syn. A. glandulosa Desf.),* an introduction from China much planted as a shade tree. It is a fast grower, but given to spreading by suckers, and the staminate flowers have a very disagreeable odour. It is a member of the Quassia family *(Simaroubaceae).*

Its leaves are compound, odd-pinnate, up to three feet in length with a large number of leaflets. The leaflets are ovate-lanceolate with 2 or more coarse teeth towards the base; some of these teeth will show a prominent gland, eventually black in colour on the under surface — a good identification mark. The leaves are rank-smelling when bruised.

The fruit is a twisted, winged body, 1½ inches long, the seed in the centre, opposite a notch, and hanging in clusters on the tree into winter; they are often purplish-red.

Staghorn Sumach

Rhus typhina L.

A member of the family Anacardiaceae, this is a small straggling tree with a characteristic flattish crown of crooked branches. It spreads underground and so will be found generally in thickets. It is a striking component of autumn landscapes with its peculiar habit and brilliant crimson foliage and fruit. There are several shrubby species of Rhus.

LEAF.—The leaves are compound, pinnate with an odd number of leaflets, 1 to 2 feet in length with stalks very hairy and often reddish on top. The leaflets (11 to 31) are oblong-lanceolate, practically without stalks, sharply serrate and very pale beneath. They turn a scarlet to purple colour in the fall.

FLOWERS.—The flowers are yellowish-green, in very large, dense terminal clusters (panicle), the staminate ones up to a foot in length, the pistillate smaller. They appear in early summer, the two kinds generally on separate trees.

FRUIT.—The fruit is a large, upright, conical, crimson cluster about 7 inches long. It persists throughout most of the winter. The unit is a small dryish stone-fruit covered with pleasantly acid, crimson hairs.

BARK.—The bark is dark brown, thin, and smooth. The wood of the tree is orange-coloured.

TWIG.—The twigs (Fig. 240) identify the tree at once, being very stout with a very dense coating of dark velvety hairs(hence the name staghorn). They exude a milky, sticky juice when broken and show a large yellowish-brown pith.

The leaf-scar is a conspicuous narrow band nearly encircling the bud. The bundle-scars are collected more or less into 3 groups.

The buds, situated within the encircling band-like scars, are globular and densely coated with dirty-whitish hairs.

We have two poisonous sumachs, included in the same family with the genus Rhus but in recent years placed in a separate genus, *Toxicodendron*. To many persons, they are extremely poisonous to the touch. They are differentiated by having a fruit looking like small, pearly-white, lustrous berries, in loose clusters, which are not terminal but occur in the angle between leaf and stem.

The Poison Ivy *(T. radicans (L.) Kuntze)*, the commonest one, is quite well-known, with its leaf of 3 leaflets, and its trailing or climbing habit.

Less well-known because usually found in swamps, and growing, sometimes to small tree-size, is the Poison Sumach, Poison Oak, Poison Dogwood or Poison Elder-berry *(T. vernix (L.) Kuntze)* It has more strongly poisonous qualities. It has fewer leaflets (7 to 13) per leaf than the Staghorn Sumach and these are not toothed; the twigs are usually mottled, not hairy, and yellowish-brown; and the leaf-scar is heart-shaped and does not encircle the bud, as in Staghorn Sumach; it shows numerous bundle-scars, these not collected into groups.

THE MAPLES

ACER

This genus, in the family Aceraceae, includes 7 tree species.

Sugar or **Hard** or **Rock Maple** *Acer saccharum Marsh.*
Black Maple *Acer nigrum Michx. f.*
Red or **Swamp Maple** *Acer rubrum L.*
Silver or **White Maple** *Acer saccharinum L.*
Mountain Maple *Acer spicatum Lam.*
Striped Maple or **Moosewood** *Acer pensylvanicum L.*
Manitoba or **Ash-leaved Maple** or **Box Elder** *Acer negundo L.*

The name, Soft Maple, is used indiscriminately for Red and Silver Maple.

The maples are large trees with the exception of the Mountain Maple and Striped Maple, which are generally seen as very small, bushy trees.

In general the range of occurrence is within the Great Lakes drainage basin, but the Mountain Maple and Striped Maple grow farther north, and the latter does not reach the southerly portion of Old Ontario.

The great bulk of the maple cut is Sugar Maple. The tree reaches good sizes and is abundant and widely distributed. The wood of this species is superior to that of any of the others, being favoured for its strength, hardness and stiffness. Its uses show great variety — furniture and fixtures; interior finish in houses, railway and electric cars; agricultural implements and vehicles; turnery; woodenware; boxes and crates; slack cooperage; destructive distillation and fuel. Most of the Soft Maple is marketed as Hard Maple. Maple sap is the source of the maple syrup and maple sugar of commerce.

LEAF.—As a group, the maples are recognized at once by their foliage. The leaves are placed opposite each other, and are radiately 3- or 5-lobed with corresponding nervation; the only exception is the Manitoba Maple described farther on. The leaves of all species of maple vary considerably, especially in the cases of the Sugar Maple and Red Maple. Their separation is based mainly on the type of teeth, and the character of the notches with particular reference to the two largest notches at the base of the middle or end lobe.

The leaf of the Sugar Maple is 5-lobed, with the notches open rounded at the bottom. Its distinctive feature is that each lobe has only a few, large, irregular, wavy teeth (Fig. 159). One does encounter branches bearing 3-lobed leaves, and trees with foliage entirely 3-lobed and without teeth have been made a variety (rugelii).

In the Black Maple (which is sometimes called merely a variety of the Sugar Maple) the leaf is less distinctly 5-lobed and shows fewer teeth than the Sugar Maple. The distinguishing feature is the dense coating of velvety, brownish hairs on the under surface of the leaf and on the leaf-stalk. The leaves are not whitish beneath as in the Sugar Maple. They are noticeable on the tree on account of their flabby look owing to the edges hanging down (Fig. 161).

The Silver Maple leaf is very deeply 5-lobed, with long rather U-shaped notches. The lobes are irregularly and rather coarsely toothed. The terminal or middle lobe is generally more distinctly trilobate than in Red Maple, and towards its base the sides

slant inwards towards the midrib (Fig. 163). Other distinctions are given in the next paragraph.

The leaf of the Red Maple (Fig. 165) is less definitely 5-lobed than that of the Silver Maple, and is often 3-lobed. The lobes are doubly serrate in both, but the leaf averages straighter across the base and less heart-shaped than in the Silver Maple. The notches, especially the two at the base of the middle lobe, are the surest distinction from the Silver Maple. These are sharp with straight edges, whereas in Silver Maple generally the sides of the notches are curved; that is to say, in the former they are V-shaped rather than U-shaped. The terminal lobe in the Red Maple has the sides towards the base nearly parallel to the midrib, and the adjacent two V-shaped notches often approaching a right angle. The leaves of both species are very white underneath. Several varieties of the Red Maple have been named, based largely on the leaf variation.

In the Mountain Maple the leaf is usually 3-lobed, but may be slightly 5-lobed. It is soft, whitish-hairy beneath, coarsely and sharply toothed with the edges of the teeth usually curved (Fig. 173).

The Striped Maple leaf is thin, greenish beneath, 3-lobed towards the tip, and uniformly, finely, and sharply, doubly serrate (Fig. 169).

The Manitoba Maple differs from all our other maples in having a compound leaf. There are generally 5 to 7 leaflets fewer than in our ashes. The leaflets are usually long-pointed, with a multitude of shapes, and variously toothed, lobed or cleft (Fig. 167).

FLOWER.—Maples have small, mostly yellowish-green flowers, in clusters. In general they are unisexual, with both kinds on the same tree; less commonly they are on separate trees (always the case, however, in Manitoba Maple), and sometimes the flowers are perfect.

The cluster is a raceme in the case of the Mountain Maple, the striped Maple, and with the pistillate flowers of Manitoba Maple. The raceme is erect in the Mountain Maple and drooping in the Striped Maple. In the other species of maple the flowers are in umbel-like clusters (Figs. 171, 172).

The Red Maple (Fig. 171) and Silver Maple are in bloom very early in spring, long before the trees leaf out. The Silver Maple is a little the earlier, and the flowers have shorter stalks than those of the Red Maple and lack the petals present in the latter. The Mountain Maple and Striped Maple are the last to flower, after the leaves are fully grown. The other species produce their flowers with the unfolding of the leaves.

FRUIT.—The fruit is a small nut provided with a long wing at one end, known as a key or samara. These samaras are arranged in pairs; frequently one of the pair is smaller or imperfectly developed (Fig. 164). The fruits of the different maples are distinguished by their size, type of cluster into which they are arranged, length of stalk, time of ripening, and angle between two keys. This latter is not at all uniform, neither is size, but each centres around a general mean, which is what is intended by the figures given below (Figs. 160 to 174).

The fruits of Red and Silver Maples are mature very early in summer, the latter the earlier and by the time the leaves are fully grown. They drop forthwith and germinate. In the case of the other maples maturity is not reached until autumn.

In the Mountain, Striped, and Manitoba Maples the fruits are arranged along a main stalk (raceme) (Fig. 174), while in the others the individual fruits of a cluster originate from the one point or nearly so (umbel-like) (Figs. 160, 162).

The fruits of Mountain Maple and Striped Maple are relatively short-stalked, and n the other five species quite long-stalked.

As regards size, the samaras of the Mountain and Red Maples average the smallest, ıbout ¾ inch in length; Striped Maple, 1 inch; Sugar and Black Maples, 1¼ inches; Manitoba Maple, 1½ inches; and Silver Maple 1⅝ inches.

The angle between the centre lines of the two keys of a pair varies within the species ıs already stated, and with the nearness to seed dispersal. In general, at maturity, it is ıbout 60 degrees in Mountain, Red, Silver, and Manitoba Maples. The two former are small, differ in the length of their stalks as noted above, and are not to be found at the same time of the year. The latter two are large, and also not available at the same time of the year. In Striped Maple the angle is practically 90 degrees. The remaining two maples, Black and Sugar, are set apart by the fact that the wings are not in line with the axes of the seeds, but are curved so as to bring them nearly parallel, especially in Black Maple. The fruits of these two are so closely alike, leaves should be used in identification. In the Manitoba Maple the wings are sometimes curved quite tongs-like.

The seed-cavity shows some helpful features also. In the Mountain and Striped Maples there is nearly always a distinct indentation on one side. The seed-bearing portion in the Manitoba Maple is quite elongated. In the Sugar, Black and Silver Maples this region has a thick, swollen, rounded appearance.

BARK.—The bark of Sugar Maple is dark gray and deeply fissured into long, thick, firm, irregular plates which often turn outwards free along one edge. Occasionally it is more or less flaky. That of the Black Maple is indistinguishable.

Silver Maple bark is reddish-brown, separated into long, thin, strip-like flakes with ı tendency to spring free at both ends.

Red Maple bark is dark gray, roughly ridged and somewhat flaky — somewhat ıntermediate between that of the two preceding species.

In Mountain Maple the bark is very thin, usually dull grayish, and smooth or lightly furrowed.

Striped Maple bark is also thin, smooth, and at first greenish streaked with white ines; eventually it becomes gray striped with darker bands and usually with transverse ough warty areas.

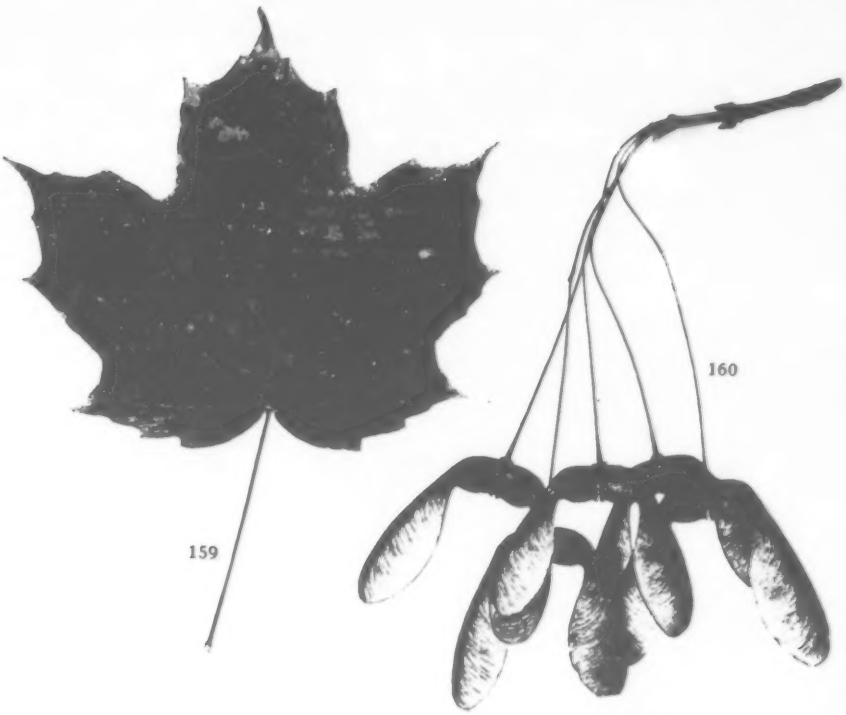
The bark of the Manitoba Maple is light gray with narrow, firm ridges.

TWIG.—A very distinctive feature of all maples is that their branches are arranged n pairs opposite each other. Of the native hardwoods described in this bulletin, the ınly other species of which this is true are the ashes, Flowering Dogwood and Nanny-ıerry. The two latter are seldom met with, while ash branches are very coarse and ıeavy-looking.

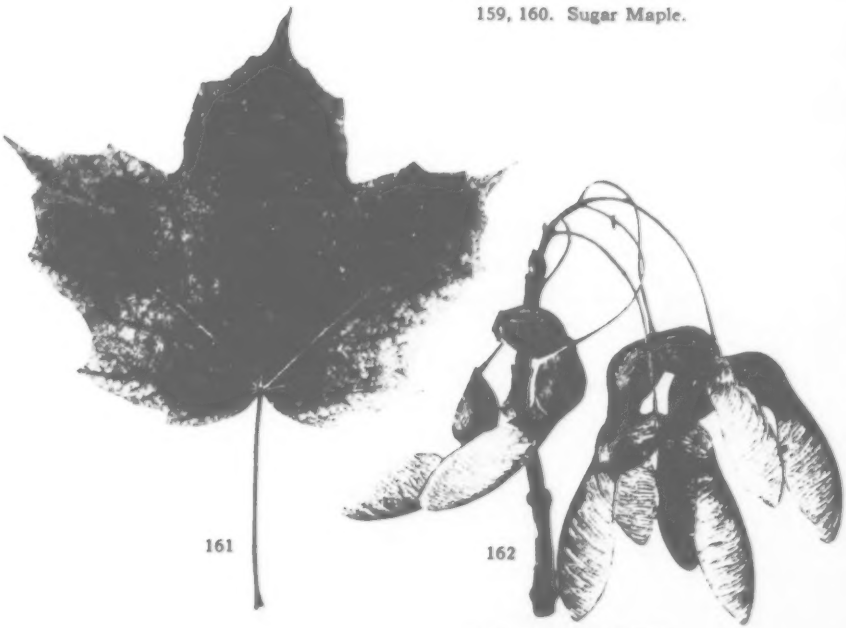
It must not be overlooked that we have many native shrubs, as well as cultivated trees and shrubs, with opposite branching also.

The twigs of Sugar Maple are reddish-brown, with conical, sharp-pointed many-scaled buds of the same colour disguised by grayish down. The sharp, grayish bud is very typical (Fig. 241).

The Black Maple bud shows but slight differences from that of the Sugar Maple, being also grayish and sharp-pointed. The bud, however, is relatively much broader (less narrowly conical); the bud-scales have their upper margins rounded and not drawn to a point as in the Sugar Maple; and the result is that the bud is less clearly 4-angled (Fig. 242).

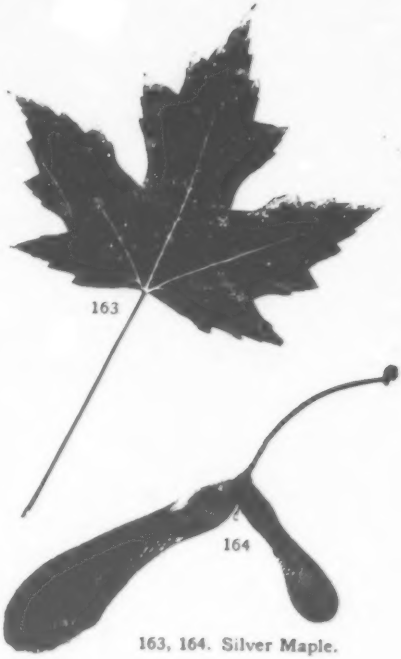


159, 160. Sugar Maple.



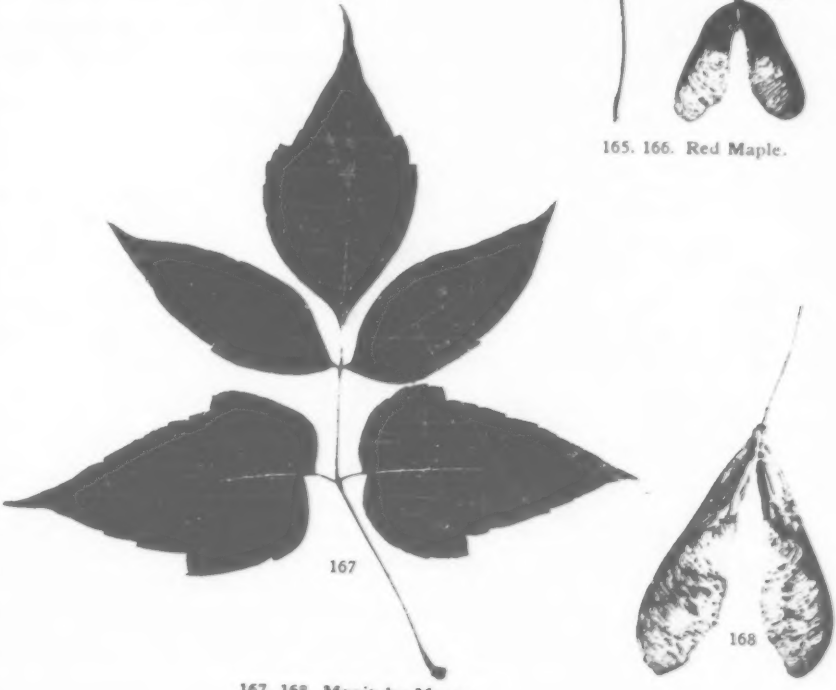
161, 162. Black Maple.

(Leaves one-half; fruits natural size).



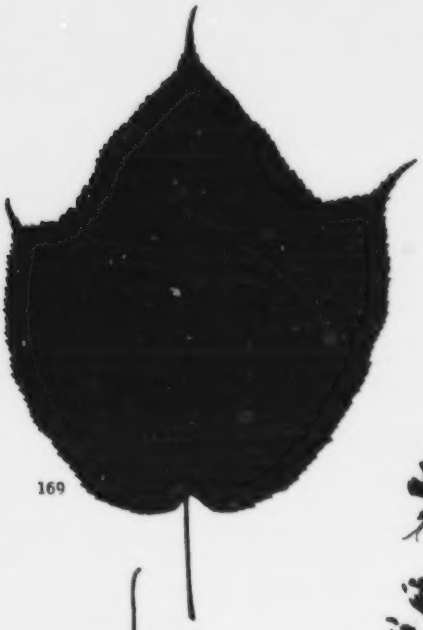
163, 164. Silver Maple.

165. 166. Red Maple.

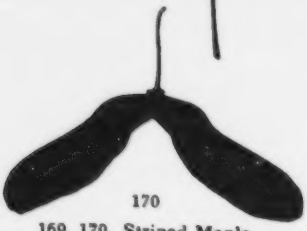


167, 168. Manitoba Maple.

(Leaves one-half; fruits natural size).



169



170

169, 170. Striped Maple.

173

171. Red Maple.

172. Sugar Maple.

174

173, 174. Mountain Maple.

(Leaves one-half; others natural size).

The remaining maples have fewer bud-scales, 2 to 4 pairs being visible.

The twigs and buds of Red Maple and Silver Maple (Figs. 243, 244) cannot be istinguished with certainty without dissection of the buds, though the twigs of the itter are credited with a rank odour when bruised. The twigs are shining red, differing om those of all other maples in being ringed with clusters of stout globular flower uds; this clustering is more pronounced in the Silver Maple. The buds are red, mooth and shining, with a rounded, blunt apex, and show 4 pairs of scales usually. The Manitoba Maple also shows extra buds to a certain extent, but they are white-hairy.

The Mountain Maple twig (Fig. 245) is slender, dull reddish-brown, at times yellowish, and is at once known by its coating of short, grayish hairs. The buds are similarly covered, and stalked, and show 2 trough-shaped scales opposed to each other. Being such a small tree, Mountain Maple in winter may be confused with certain shrubby dogwoods, with very similar-looking buds and opposite branching, but the hairiness of the twig and the absence of dark longitudinal lenticels on it will identify this maple.

The twig of the Striped Maple is reddish- or greenish-brown, and is shiny, with no hairs as in Mountain Maple. The older branchlets show the characteristic white streaks of the bark. The buds are stalked and resemble those of Mountain Maple, but are larger, clean because lacking the hairiness of the latter and rather 4-sided (Fig. 246).

In the Manitoba Maple the twigs vary from yellowish-green to purplish-brown. They may have a polished appearance, or may be covered with a whitish bloom which is easily rubbed off. The buds are quite blunt and told easily by their white woolly coating; this is especially noticeable at the tip of the bud where the scales gape apart (Fig. 247).

All maples usually show two extra buds alongside the terminal one.

The leaf-scars of maples are V-shaped to narrow U-shaped, with the opposite pairs nearly meeting around the stem. Actual contact is the rule in the Mountain Maple, with a projection upward along the stem at the junction. The scar shows 3 bundle-scars, or accasionally 3 groups, a helpful character when distinguishing a maple from an ash.

A great many species of maple are grown as shade trees and for ornamental purposes. All our native forest species are used, with the exception of Mountain Maple and Striped Maple. Possibly the Sugar, Manitoba, and Silver Maples are favoured most. In the case of the latter species the forms used are mainly those with very pendulous branches, or with leaves very deeply lobed and dissected or variegated.

Of introduced species, the commonest are from Europe, the NORWAY MAPLE *(A. platanoides L.)* and the SYCAMORE MAPLE *(A. pseudoplatanus L.)*. These are planted in a great variety of garden forms differing mainly in shape and colour of the leaves.

The typical Norway Maple is recognized readily by its leaf. This resembles that of Sugar Maple somewhat, but the toothing is regularly wavily dentate, the teeth have bristle-like tips, and the leaf is strikingly green on the under surface. The fruit is conspicuously large, 2 inches or longer, with the two keys nearly in a straight line. The bark is very pleasing, being nearly black and neatly fissured into firm narrow ridges. The buds are much larger than those of native species, blunt, rounded, shining and mostly reddish-brown. A milky juice can be squeezed out from a cut bud or leaf-

stalk. The Sycamore Maple leaf is very thick, very white beneath and gives the impression of being wrinkled or shrivelled on the upper surface. The notches are deep, and sharp at the base. The toothing is rather regular and small, serrate with the teeth spaced far apart. The bark is reddish-brown and very characteristic in flaking into small rectangular scales. The buds resemble those of the Norway Maple in size and shape, but are greenish.

The common HORSECHESTNUT *(Aesculus hippocastanum L.)* (family, *Hippocastanaceae)*, a native of the Balkan Peninsula in southeastern Europe, is used extensively in street planting, and occasionally other members of the genus.

It has opposite leaves, compound, with usually 7 leaflets radiating out from the end of a long stalk. The leaflets are bluntly serrate and strongly pinnately veined, roughly recalling a true Chestnut leaf.

The flowers are white spotted with purple and yellow, and arranged in large showy clusters.

The fruit is a large, leathery, globose, prickly pod containing 1 to 3 large, shiny, brown seeds.

The winter-twigs are coarse, few in number, with dark brown, resinous-sticky buds ¾ inch long.

Basswood

Tilia americana L. (syn. T. glabra Vent.)

Basswood belongs in the family, *Tiliaceae*. It is known also as Linden, Lime-Tree and Whitewood. It is scattered throughout Ontario south of the Height of Land.

Basswood is an important hardwood in the province. While the wood is soft and light, it is quite tough and possesses a fine and even texture. Its strongest competitor is Yellow Poplar or Tulip from the United States.

LEAF.—The leaf is large, 5 inches or more long and nearly as wide, usually heart-shaped with one side better developed at the base. The teeth are serrate and strongly glandular-tipped, and usually large (Fig. 175).

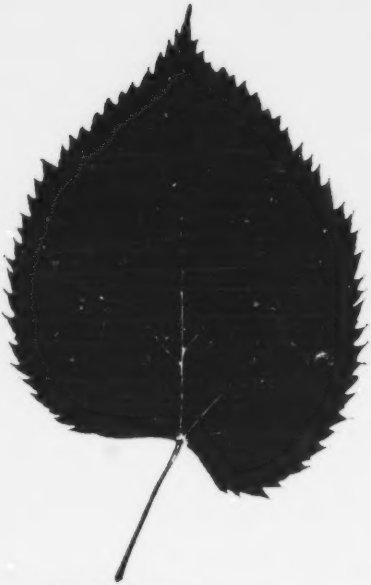
FLOWER.—The flowers are creamy-yellow, fragrant and arranged in an approximately radiate cluster (cyme) on a long common stalk. This stalk is united to a long, narrow, leaf-like bract.

FRUIT.—The fruit is in similar clusters, with this bract. The individual fruit is a small, dry, woody, pea-like body coated with tawny hairs and usually containing one seed (Fig. 177). The fruits persist into the winter.

BARK.—The bark is grayish-brown and fissured into rather narrow, flat, scaly ridges.

TWIG.—The twigs are reddish, often covered with a grayish skin. The inner bark of the Basswood is very tough-fibrous, and on a cross section of the twig the strands are very evident as radiating, whitish, solid V-shaped masses. If the twig be scraped gently lengthwise the fibres appear as whitish lines curving around darker, chambered, elliptical masses.

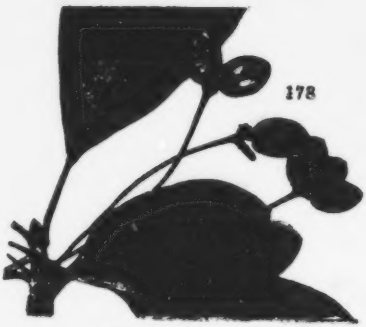
The leaf-scar is semi-oval, large, elevated, with usually numerous bundle-scars. Accompanying each are two elongated dissimilar stipule-scars.



175. Basswood.

176. Nannyberry.

177. Basswood.



178, 179. Black Gum.

180, 181, 182. Flowering Dogwood.

(Leaves one-half; fig. 178 three-quarters; others natural size).

The buds are glossy red, large, stout ovoid, often somewhat flattened, pointed, and arranged in 2 rows. Only 2 or 3 scales are visible, with a large one on one side which makes the bud lopsided. The bud does not sit squarely above the leaf-scar, but always to the one side (Fig. 248).

Several species of Basswood of foreign origin are planted along streets, nearly all sold as EUROPEAN BASSWOOD (Linden or Lime).

The LARGE-LEAVED LIME *(T. platyphyllos Scop.)* is recognized easily by the scattered covering of long white hairs on the branchlets, leaf-stalks, and under surface of the leaves, this surface, however, being green.

The SMALL-LEAVED LIME *(T. cordata Mill.)* has much smaller roundish leaves, not over 2½ inches long, and without hairs on the under surface except in the angles between veins and midrib.

The WHITE LIME *(T. tomentosa Moench)* is at once known by the very dense, silvery-white mat of hairs covering the under surface of the leaves.

The CRIMEAN LIME *(T. euchlora K. Koch)* is noted for the dark and very glossy green upper surface of its leaves, conspicuously distinct in this appearance. It is supposed to be of hybrid origin.

Another hybrid, the COMMON LIME *(T. vulgaris Hayne)* has leaves resembling those of the LARGE-LEAVED LIME, but without hairs on the under surface except at the junction of lateral veins and midrib.

THE DOGWOOD AND TUPELO FAMILY
CORNACEAE

This family includes two genera: *Cornus* and *Nyssa.* Some authors place these in separate families: *Cornaceae* and *Nyssaceae.*

THE DOGWOODS
CORNUS

Flowering Dogwood *Cornus florida L.*
Roughleaf Dogwood *Cornus drummondii C. A. Meyer*
Alternate-leaved Dogwood *Cornus alternifolia L. f.*
Roundleaf Dogwood *Cornus rugosa Lam.*

There are many species of Dogwood in Ontario, the majority of them shrubs; the above four species, however, may be encountered as trees. The Flowering and Roughleaf Dogwood are confined to the Deciduous Forest region. The Alternate-leaved Dogwood extends to the Height of Land. The Roundleaf Dogwood is encountered more often as a shrub than as a tree; it occurs across the northerly part of the province.

All dogwoods have their leaves and branches opposite, with the exception of the Alternate-leaved Dogwood. The leaf in all of them is to be recognized by the tendency of the lateral veins to curve upwards towards the tip (Fig. 182).

LEAF.—The foliage in both the Flowering Dogwood and the Alternate-leaved

ogwood is mostly clustered towards the ends of the branches, with the leaves pposite in the former, and in the latter alternate but almost opposite, or occasionally uly so. In both, the leaf is usually oval, quite whitish beneath, without teeth on he margin or slightly wavy with a hint of toothing, and with the characteristic enation mentioned above. The leaves of the Roughleaf Dogwood are not clustered t the ends of the branches and except for the presence of scattered, bristly hairs n their upper surfaces are otherwise similar to the Flowering Dogwood leaf. The Roundleaf Dogwood leaf is almost circular in outline and white-woolly beneath.

FLOWER.—In the Flowering Dogwood the flowers are very showy affairs just preceding the leaves. The individual flowers are small, insignificant, greenish bodies, but they are grouped into compact rounded clusters, each cluster surrounded by four, large, white leaves (enlarged bud-scales) looking like petals and giving to the flower its display. These are finely parallel-veined, 1 to 1¼ inches long, obovate, and with a purplish-coloured notch at the outer end (Fig. 180).

In the Alternate-leaved, Roughleaf, and Roundleaf Dogwoods, the flowers are small, cream-coloured, and arranged in large, flattish-umbrella-like clusters. There are no showy white leaves as in the former species.

FRUIT.—The fruit in dogwoods is of the stone-fruit or plum type. In the Flowering Dogwood the fruits are scarlet, ovoid, ½ inch long, and mixed with them in the close cluster are many undeveloped ones (Fig. 181).

In the Alternate-leaved Dogwood and the Roughleaf Dogwood, they are globular and have reddish stems, and are dark blue in the former, but white in the latter. The Roundleaf Dogwood has globular, light blue, rarely white fruits on greenish stems.

BARK.—In the Flowering Dogwood the bark is reddish-brown and cracked into roundish to four-sided scales, the effect recalling alligator leather.

The Alternate-leaved Dogwood has thin, reddish-brown bark which is smooth or shallowly fissured.

The bark of the Roughleaf Dogwood is separated into narrow ridges which are broken across at intervals into thin, slightly elongated, dark red-brown, close-fitting scales.

The bark of the Roundleaf Dogwood is smooth, green spotted with purple, turning purplish or yellowish.

TWIG.—The twigs of the Flowering Dogwood (Figs. 250, 251) are usually dark reddish, with white hairs giving a bloom-like appearance.

The leaf-scars on these twigs are characteristic. The two terminal ones on the season's twigs are semicircular and elevated on the remains of the leaf-stalk. Between the pair is a deep V-shaped notch in which is placed the terminal bud. On the older portion of the twig the leaf-scars are narrow and ring-like, and where not elevated the two practically encircle the twig. There are usually 3 bundle-scars.

The terminal leaf-bud in the notch is flattened conical, with a downy tip and one pair of scales. These two, form a rounded longitudinal channel on either side of the bud, where they meet. The lateral leaf-buds are minute, hairy, just peeping up behind the leaf-scars or else completely hidden by the leaf-stalk bases (Fig. 250). The terminal flower-buds are grayish, spherical to inverted short turnip-shaped, very abundant, and constitute the most distinctive feature of the tree. Each shows 2 bud-scales standing away from each other; the gaps between show two strips of an inner pair of bud-scales (Fig. 251). It is these 4 bud-scales which develop later into the white

showy portion of the flower cluster (Fig. 180). Below the flower-buds, are paired leaf rudiments.

The twigs of the Roughleaf Dogwood are pale red, slightly hairy and lustrous. The leaf-scars are line-like, not elevated on leaf-stalk bases and encircle the twig. They show 3 bundle-scars. The buds with 2 pairs of opposite scales are silky downy and fully exposed, the terminal about ¼ inch long, the laterals smaller.

The twigs of Roundleaf Dogwood are without hairs, yellowish-green, with raised purple spots and streaks; the pith is white.

In the Alternate-leaved Dogwood (Fig. 252), the twigs are glossy, and greenish-red to purplish-red. This tree has the same habit as the Sassafras, of producing long, slender, lateral branches exceeding the main twig in length — its best recognition feature.

The leaf-scar is sharply crescentic with 3 bundle-scars.

The terminal bud is ovoid, sharp, with 2 or 3 brown scales, with the outer ones usually gaping.

Black Gum *Nyssa sylvatica Marsh.*

This species is a medium-sized tree confined to the Lake Erie region, and is variously known as Sour Gum, Tupelo and Pepperidge.

LEAF.—The leaf is extremely variable in size and shape, being oval, elliptic or obovate. It is very lustrous, entire, often slightly wavy on the margin, and turns a deep scarlet colour on the upper surface in the autumn (Fig. 179).

FLOWER.—The flowers are very small, greenish-white, in clusters at the top of a long stalk, and appear with the leaves.

FRUIT.—The fruit is an ovoid, blackish-blue stone-fruit about ⅜ inch long, with a thin, oily, sour flesh. From 1 to 3 are found together on a long, slender stalk (Fig. 178).

BARK.—The bark is dark gray, at first flaky but becoming furrowed into thick, rough, irregular ridges, which are broken across into block-like segments often.

TWIG.—The twigs are reddish-brown usually hidden by a grayish skin. The pith when cut lengthwise shows hard, greenish partitions across it, recalling that of Tulip.

The leaf-scar is semi-oval to crescentic with 3 sunken bundle-scars.

The terminal bud is ¼ inch, stout ovoid, sharply pointed with the end slightly curved, dark reddish-brown in colour and at times hairy-tipped (Fig. 249).

THE ASHES
FRAXINUS

This genus, in the family *Oleaceae*, includes four tree species.

White Ash *Fraxinus americana L.*
Black or **Swamp Ash** *Fraxinus nigra Marsh.*
Blue Ash *Fraxinus quadrangulata Michx.*
Red Ash *Fraxinus pennsylvanica Marsh.*

Ashes are noted for the high quality of their wood but the amount sawn in the province is so small that the needs of the wood-using industries must be met almost

entirely by importation. Of the four species in our forest, the most valuable is the White Ash, and this probably forms the bulk of ash lumber, though all species except Black Ash are sold as White Ash. The wood of White Ash is hard, heavy, strong, straight-grained, and elastic. It is especially desirable for those uses where strength is wanted, but not the rigidity of maple. It is used extensively in the manufacture of hand'es, agricultural implements and machinery, vehicles and furniture. Black Ash is a much softer and weaker wood, suitable for interior finish in houses, slack cooperage and basket veneer.

The Black Ash extends far north into the Hudson bay drainage. The other species are confined to Old Ontario, with the Blue Ash found only in the Lake Erie area.

LEAF.—The leaves of all ashes are opposite, compound, with an add number of leaflets (5 to 11) which are arranged along the midrib in pairs except for the odd terminal one (Fig. 185). Each leaflet has a stalk except in the case of the Black Ash. The leaflets of the different species differ mainly in shape and the type of toothing.

The leaflet of the White Ash is the broadest in relation to its length of all the species, generally oval; the stalks are the longest on the average, often ½ inch; it is very pale beneath, and the margin is without teeth or with inconspicuous ones.

The Red Ash leaflet is lanceolate-oval, gradually narrowed into a long slender point, and inconspicuously toothed. It is recognized at once by the soft hairiness of the under surface of the leaflet and of the midrib of the whole leaf. This same hairiness is to be found on the twigs for one or more seasons and also on the fruit-stalks.

Ash trees will be encountered showing all degrees of hairiness of leaves, fruit stalks and branchlets. Such must be referred to Red Ash, except the extreme specimens, and for this reason a variety of Red Ash has been recognized by some authors and has the name Green Ash *(F. pennsylvanica var. subintegerrima (Vahl) Fern.)*. It is often difficult to decide whether to refer certain trees to the species or to the variety. The naming of varieties should not be attempted until the species are well known.

The leaflet of the Blue Ash is quite green beneath, with the margin distinctly and coarsely serrate.

In the Black Ash the lateral leaflets are without stalks and finely serrate.

FLOWER.—The flowers of ash are small, in rather compact clusters (panicle), appearing mostly before the leaves. The staminate and pistillate flowers are on different trees, but perfect flowers may also occur (Figs. 187, 188).

FRUIT.—The fruit is a samara as in the maple, but they are not paired in the cluster. After maturity the fruits remain on the tree into the winter except in the case of Blue Ash.

In the Black Ash and Blue Ash the body of the fruit is flattened, and the terminal wing runs down along the body of the fruit and completely surrounds it. There is no minute collar (perianth) at the lower end of the fruit as in all the other species (Fig. 186).

In the other two species, the body of the fruit is cylindrical, tapering to the ends, and the wing is mainly at one end. In the White Ash the wing extends down the sides a little, while in the Red Ash it can be traced quite definitely to below the middle of the body. The White Ash fruit averages slightly thicker than the Red Ash, or forms of it (Figs. 183, 184, 189).

BARK.—The bark of the Black Ash is light gray, scaly and easily rubbed off by hand. Occasionally it is ridged, but the scaly nature persists.

Blue Ash bark is also scaly in character, but the scales are larger, coarser and firmer.

In the other ashes, the bark is finely furrowed into firm ridges. These ridges are irregular, running into one another more or less and outlining diamond-shaped areas in the furrows. They are also frequently cracked across. In the White Ash, in general, the whole pattern of the bark is on a heavier scale and of a darker colour than in the Red Ash.

TWIG.—Ash twigs are stout, with conspicuous buds and leaf-scars in pairs. They are enlarged at each pair of leaf-scars and flattened between the pairs of buds.

The twigs of White Ash are mostly light brown to deep brown and shiny, or with a dull grayish skin (Fig. 257).

The twigs of Black Ash are usually grayish and dull, not shiny as White Ash (Fig. 256).

The twigs of Red Ash are more slender than those of White Ash and densely hairy. This heavy coat disappears in the second season as a rule (Fig. 258). The degree of hairiness on the twigs of this species varies greatly (referred to under Leaf). Specimens with practically hairless twigs are referred to as Green Ash (Fig. 259).

The twigs of Blue Ash are 4-sided (quadrangulate) with two ridges running from each leaf-scar to the corresponding scar below (Fig. 260).

LEAF-SCAR.—The leaf-scars of all ashes are conspicuous on the twigs, varying from crescentic to semi-circular, with a large number of bundle-scars. These are arranged in a single curved line in the narrower leaf-scars, but in the broader ones the line of scars duplicates the outline of the scar itself but is never quite closed. The crescentic type is commonest in the White Ash.

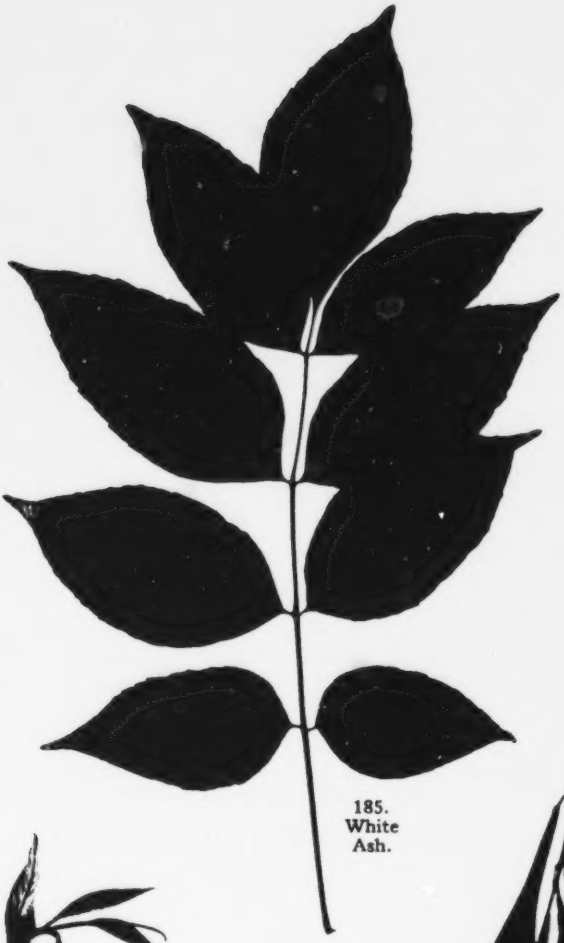
BUD.—The buds of ash vary from light brown to almost black, the former colour rarest in the White Ash, while the blackest buds occur on Black Ash.

The White Ash terminal bud is ¼ inch long, rather 4-sided in shape, blunt, and generally broader than long. The terminal bud of Black Ash is generally as long as or longer than broad, with a wedge-shaped tip, and the adjoining pair of lateral buds is generally slightly removed from the terminal bud (Fig. 256); whereas in all the other species this pair is usually almost on a level with the bud at the end. Several twigs should be examined for this feature.

The EUROPEAN ASH *(F. excelsior L.)* in many forms is planted frequently. It resembles our native Black Ash in its fruit, and in the leaflets being without stalks. But in the Black Ash there is a dense collection of rusty hairs at the joint of each pair of leaflets which is absent in the EUROPEAN ASH. The leaves of the latter are also very green below. Further, EUROPEAN ASH bark is ridged, not scaly, and the buds are very black.

The Trumpet Creeper Family *(Bignonaceae)* is represented in Ontario by a few species of Catalpa. The most popular species is the CATALPA OR BEAN TREE, favoured for its large tropical-looking leaves, and showy flowers appearing relatively late in the summer. Probably the HYBRID CATALPA *(C. hybrida Spaeth)* is the commonest. It has extremely large, flabby, usually heart-shaped leaves. The flowers are funnel-shaped with a flaring mouth, white with two yellowish stripes down the

183. Green Ash.



185. White Ash.

186. Black Ash.

184. White Ash.

187. Staminate.

188. Pistillate.

189. Red Ash.

White Ash Flowers.

(Leaves one-half; others natural size).

inside, which is also heavily spotted purplish-brown, and arranged in large pyramidal, branched clusters. The fruit is a long pod, up to a foot in length, containing many seeds winged on each side, the wings with fringed ends. The pods, hanging downwards from the branches, remain on the tree through the winter, splitting lengthwise and gradually releasing the seeds.

The NORTHERN CATALPA *(C. speciosa Warder)*, a native of the central region of eastern United States, has larger flowers than the Hybrid Catalpa, about 2½ inches in diameter. They are inconspicuously spotted inside and there are relatively few in an open cluster.

The JAPANESE CATALPA *(C. ovata Don)* has small flowers, and pods which are quite slender ($^3/_{16}$ inch). The flowers are yellow, striped and spotted inside, and about 1 inch long. The leaf is not white downy beneath as in the other species, but has dark reddish spots on the under surface at the junction of the veins with the midrib. The leaves on this species show a stronger tendency to be lobed than do those of the others.

Catalpas are very late in leafing out, and the leaves turn black and fall with the first frost. The easiest recognition mark is the arrangement of leaves or leaf-scars in whorls of three, or opposite. The twigs lack terminal buds, in this they are unlike our native trees that have opposite buds.

Nannyberry

Viburnum lentago L.

This species is in the Honeysuckle family, *Caprifoliaceae*, which includes many highly prized ornamentals — Elderberries, Honeysuckle, Weigela, Beauty Bush, and others. Only the Viburnum group, which is mainly composed of shrubs has a species deserving to be classed as a tree, the Nannyberry, known also as the Sweet Viburnum and Sheepberry.

LEAF.—All Viburnums have opposite leaves. The leaf of the Nannyberry is oval, 3½ inches long, finely serrate, with the petiole grooved and with the blade continued as narrow wings along it more or less (Fig. 176).

FLOWER.—The flowers are small, whitish, and arranged in large, dense, rounded, radiate, many flowered clusters.

FRUIT.—The fruit is berry-like, on reddish stems, bluish-black with a bloom, ovoid, ⅜ inch long, sweet and edible, with a flat stone inside.

BARK.—The bark is grayish-brown broken into small irregular scales.

TWIG.—The twigs are smooth, tough-flexible, and very offensive smelling when broken.

The leaf-scar is U-shaped with 3 bundle-scars.

The buds are covered with one pair of scales, face to face, these covered with mealy hairs. The terminal leaf-bud is ¾ inch long, conical, sharp, and deep reddish-brown beneath the hairs (Fig. 253). The terminal flower-buds are similar with a very bulbous base.

MEANINGS OF SPECIAL TERMS

Acuminate — applied to a leaf which tapers to the apex.
Alternate — with but one leaf at any particular region of the branch.

Barred (pith) — pith continuous but showing partitions across (Fig. 254).
Blade — the expanded flattish part of a leaf.
Bud — an undeveloped branch or flower shoot, generally covered with bud-scales and most conspicuous in the winter.
Bud-scales — the modified leaf parts covering most buds.
Bundle-scars — the marks on the leaf-scar indicating where the veins of the leaf-stalk joined the stem (Figs. 197, 200).

Calyx — the outermost and lowermost leaf-like parts of a flower.
Carpel — the central portion of a flower, later bearing the seeds.
Catkin — a unisexual, scaly, cylindrical flower-cluster, in which each flower is without a stalk (spike), the whole cluster usually coming away as one piece (Figs. 41, 67); often also applied to the corresponding fruits (Figs. 69, 70).
Chambered (pith) — pith not solid or continuous, but showing cavities (Fig. 255).
Compound (leaf) — one with the blade divided into separate parts or leaflets (Figs. 145, 157); if each part be again subdivided the whole leaf is said to be doubly or twice compound.
Cone — a fruit like that of a pine, consisting of woody overlapping scales (Fig. 9).
Conifers — trees whose fruit is a true cone.
Corolla — the leaf-like parts of a flower just inside the calyx, and generally giving it the distinctive colour.
Crenate — toothed with the ends of the teeth rounded, giving a scalloped appearance (Fig. 109).
Cyme — a flower cluster in which the central or terminal flowers open first.

Deciduous (trees) — those whose leaves die the same year as they appear.
Dentate — sharply toothed, with the two sides of the teeth of equal length.

Entire — the margin without teeth or indentations (Fig. 114).
Evergreen (trees) — those whose leaves do not fall the same year as they appear.

Flaky or scaly — the outer bark rubbing off readily as loose pieces.
Flower-buds — those which will unfold to produce flowers only.
Forking (veins) — in leaves with double teeth where one vein serves two or more of the larger teeth by branching near the margin.
Fruit — the seed or seeds and the parts accompanying them.

Glaucous — covered with a whitish bloom (Fig. 247).
Globose — globular, roundish.

Internode — the portion of a stem between two leaf-bearing places.

Key — a nut fruit provided with a wing, as Ash or Maple (Figs. 160, 186).

Lanceolate (leaf) — several times as long as broad, tapering, and widest towards the base (Fig. 48).
Lateral (buds) — those along the sides of a twig; (veins), those branching off from the midrib of a leaf (Fig. 103).
Leaf-bud — one which will produce leaves but no flowers.
Leaflet — each portion of a compound leaf (Fig. 149).
Leaf-scar — the mark on a stem indicating where a leaf fell off (Fig. 257).
Lenticel — a corky outbreak in young bark, often becoming elongated horizontally as the tree grows.
Linear (leaf) — several times as long as broad, with the edges mostly parallel (Figs. 32, 34).
Lobe — a division of a leaf too large to be called a tooth (Figs. 87, 117, 169).

Midrib — the main central vein of a leaf.

Needle-like (leaves) — extremely narrow compared to their length (Figs. 2, 22).
Nodes — the portions of a stem where leaves originate.

Oblanceolate — the reverse of lanceolate, with the broad area towards the apex.
Oblong — about twice as long as broad with approximately parallel edges.
Obovate — the reverse of ovate, with the broad area towards the apex.
Opposite — with two at the same level on the stem, facing each other.
Oval — broadly elliptical with the widest part at the middle like a dish tray (Fig. 49).
Ovary — the region of the pistil that contains the seeds.
Ovate — not more than twice as long as broad and widest below the middle, like the section of an egg (Fig. 51).
Ovoid — applied to a solid object whose longitudinal section is oval or ovate.

Palmate (leaf) — with the separate leaflets originating from one common point; (venation) — with the main veins radiating from one point (Figs. 154, 159).
Panicle — a double-raceme type of cluster.
Perfect (flower) — one containing both stamens and pistil (Fig. 120).
Petiole — stalk of a leaf.
Pinnate (leaf) — with the separate leaflets arranged along either side of the stalk (Fig. 145); (venation) — when the main veins branch off along the two sides of the central midrib (Fig. 103).
Pistil — the central portion of a flower, later bearing seeds.
Pistillate — having pistils only (Fig. 42); at times used with reference to a flower in which the stamens are sterile.
Pith — the softer central region of a twig.
Pollen — minute grains borne in the top of a stamen, which give rise to male elements.

Raceme — a cluster with a long axis along which stalked flowers or fruits are arranged uniformly (Figs. 142, 144).
Radiate — palmate.

Samara — a nut fruit with a wing, as Ash or Maple (Figs. 160, 186).
Scaly or flaky bark — rubbing off readily as loose pieces.
Seed — a dormant plant with its protective coats, arising in a pistil.

Serrate — saw-toothed margin with one edge of the tooth longer than the other (Fig. 175).
Sessile — without a stalk.
Simple (leaf) — one not divided into separate leaflets (Figs. 80, 87).
Spike — a cluster like a raceme except that the individual flowers are sessile or practically so (Fig. 67).
Stamens — the pollen-bearing organs of a flower.
Staminate — having stamens only (Fig. 41).
Stipules — small, usually leaf-like, appendages at the base of a leaf-stalk (Fig. 48).
Stone-fruit — a fleshy fruit with an inner stony part, like a Plum or Cherry.

Texture — how a leaf feels between the fingers.
Twig — the most recent growth at the ends of the branches, that of the last growing season.

Umbel — an umbrella-like cluster in which the stalks of the individual flowers or fruits spring from the same point (Figs. 140, 143).
Unisexual — a flower containing only stamens or only pistils; also used when either organs are aborted (Figs. 67, 84).

Venation — the system or arrangement of veins in a leaf; this may be pinnate or palmate.

Whorled — with more than two leaves at the same level on the stem.

190. Willow.

191. Aspen.

192. Large-toothed Aspen.

193. Balsam Poplar.

194. Cottonwood.

195. Bitternut Hickory.

196. Pignut Hickory.

197. Shagbark Hickory.

198. Big Shagbark Hickory.

199. Mockernut Hickory.

(All figures natural size).

200. Butternut. 201. Walnut. 202. Hornbeam. 203. Blue Beech. 204. Gray Alder.

205. Yellow Birch. 206. White Birch. 206a. Gray Birch. 207. Beech. 208. Chestnut. 209. Dwarf Chestnut Oak.

(All figures natural size).

210. Red Oak. 211. Black Oak. 212. Pin Oak. 213. White Oak. 214. Bur Oak.

215. Swamp White Oak. 216. Chestnut Oak. 217. White Elm. 218. Rock Elm. 219. Red Elm.

(All figures natural size).

220. Hackberry.

221. Red Mulberry.

222. Cucumber Tree.

223. Tulip-Tree.

224. Papaw.

225. Sassafras.

226. Witch-Hazel.

227. Sycamore.

228. Wild Crab.

229. Mountain Ash.

(All figures natural size).

230. Red Cherry.

231. Black Cherry.

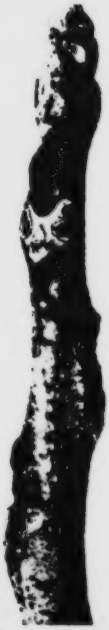
232. Choke Cherry.

233. Canada Plum.

234. June Berry.

235. Honey Locust.

236. Black Locust.



237. Coffee-Tree.

238. Red-Bud.

239. Hop-Tree.

(All figures natural size).

240. Staghorn

241. Sugar Maple.

242. Black Maple.

243. Red Maple.

244. Silver Maple.

245. Mountain Maple.

246. Striped Maple.

247. Manitoba Maple.

248. Basswood.

249. Black Gum.

(All figures natural size).

250. Flowering Dogwood.

251. Flowering Dogwood.

252. Alternate-leaved Dogwood.

253. Nannyberry.

254. Barred Type of Pith.

255. Chambered Type of Pith.

256. Black Ash.

257. White Ash.

258. Red Ash.

259. Green Ash.

260. Blue Ash.

(All figures natural size).

INDEX

Numbers in **boldface** type are the Figure numbers of illustrations

A

Abele, 43.
Abies balsamea, 33, **34, 35.**
A. concolor, 34.
Aceraceae, 89.
Acer negundo, 89, **167, 168, 247.**
A. nigrum, 89, **161, 162, 242.**
A. pensylvanicum, 89, **169, 170, 246.**
A. platanoides, 95.
A. pseudoplatanus, 95.
A. rubrum, 89, **165, 166, 171, 243.**
A. saccharinum, 89, **163, 164, 244.**
A. saccharum, 89, **159, 160, 172, 241.**
A. spicatum, 89, **173, 174, 245.**
Aesculus hippocastanum, 96.
Ailanthus altissima, 87.
Alder, Black, 55.
European, 55.
Green, 101.
Gray, 53.
Alnus glutinosa, 55.
A. incana, 53.
A. rugosa, 53, **65, 66, 204.**
A. vulgaris, 55.
Alternate-leaved Dogwood, 98, **252.**
Amelanchier arborea, 80, **132,133, 234.**
Anacardiaceae, 88.
Annonaceae, 70.
Arbor-vitae, 34.
Ash, Black, 100.
Blue, 100.
European, 102.
Green, 101.
Red, 100.
Swamp, 100.
White, 100.
Ash-leaved Maple, 89.
Asimina triloba, 70, **121, 122, 224, 254.**
Aspen, 42.
Austrian Pine, 28.

B

Balm of Gilead, 43.
Balsam, 33.
Balsam Fir, 33.
Balsam Poplar, 42.
Bark, types of, 16.
Basswood, American, 96.
European, 98.
Beaked Willow, 39.
Bean-Tree, 102.
Beech, American, 55.
Blue, 53.
European, 55, 56.
Betulaceae, 48.
Betula alba, 50.
Betula alleghaniensis, 48, **70, 71, 205.**
B. papyrifera, 48, **69, 72, 206.**
B. papyrifera cordifolia, 49.
B. pendula, 50.
B. populifolia, 48, **68, 68a, 206a.**
B. lenta, 48.
Bignonaceae, 102.
Big Shagbark Hickory, 46.
Big Shellbark Hickory, 46.
Birch, Black, 48.
Canoe, 48.
Cherry, 48.
European, 50.
Gray, 48.
Paper, 48.
Silver, 48.
Sweet, 48.
White, 48.
Wire, 49.
Yellow, 48.
Bird Cherry, 76.
Bitternut Hickory, 46.
Black Alder, 55.
Black Ash, 100.
Black Birch, 48.
Black Cherry, 76.
Black Gum, 100.
Black Locust, 86.
Black Maple, 89.
Black Oak, 56.
Black Oak Group, 57.
Black Spruce, 29.
Black Walnut, 43.
Black Willow, 39.
Blue Ash, 100.
Blue Beech, 53.
Blue Spruce, 33.
Boreal Forest region, 10.
Box Elder, 89.
Broad-leaved trees, 38.
Bud, 15.
Bur Oak, 56.
Butternut, 43.
Buttonwood, 74.

C

Canada Plum, 76.
Canoe Birch, 48.
Caprifoliaceae, 104.
Carolina Poplar, 43.
Carpinus caroliniana, 53, **75, 76, 203.**
Carya cordiformis, 46, **55, 195.**
C. glabra, 46, **54, 196.**
C. laciniosa, 46, **58, 198.**
C. ovalis, 46.
C. ovata, 46, **56, 57, 197.**
C. tomentosa, 46, **59, 199.**
Castanea dentata, 56, **77, 78, 79, 208.**
Catalpa, Hybrid, 102.
Japanese, 104.
Northern, 104.
Catalpa hybrida, 102.
C. ovata, 104.
C. speciosa, 104.
Cat Spruce, 29.
Cedar, Red, 35.
Southern White, 35.
White, 34.
Celtis occidentalis, 67, **111, 112, 220, 255.**
Cercis canadensis, 85, **154, 155, 156, 238.**
Chamaecyparis pisifera, 35.
C. thyoides, 35.
Cherry, Bird, 76.
Black, 76.
Choke, 76.
Fire, 76.
Pin, 76.
Red, 76.

Cherry Birch, 48.
Chestnut, Horse, 96.
Sweet, 56.
Chestnut Oak, 56.
Chestnut Oak Group, 63.
Chinese Sumach, 87.
Chinquapin Oak, 56.
Choke Cherry, 76.
Classification of trees, 12.
Coffee-Tree, 85.
Colorado Spruce, 32.
Common Juniper, 37.
Cone trees, 24.
Coniferous trees, 24.
Cork Elm, 64.
Cornaceae, 98.
Cornus alternifolia, 98, **252.**
C. drummondii, 98.
C. florida, 98, **180, 181, 182, 250, 251.**
C. rugosa, 98.
Cottonwood, 42.
Crab-Tree, 80.
Crab, Wild, 80.
Crack Willow, 41.
Crataegus, 76.
Cucumber-Tree, 69.
Cupressaceae, 34.
Cypress, False, 35.
Sawara, 35.

D

Deciduous Forest region, 9.
Deciduous trees, 38.
Distribution of forests, 9.
Dogwood, Alternate-leaved, 98.
Flowering, 98.
Poison, 88.
Roughleaf, 98.
Roundleaf, 98.
Dwarf Chestnut Oak, 56.

E

Elm, American, 64.
Cork, 64.
English, 67.
Red, 64.
Rock, 64.
Scotch, 67.
Slippery, 64.
White, 64.
English Elm, 67.
English Oak, 64.
European Ash, 102.
European Basswood, 98.
European Birch, 50.
European Larch, 29.
European Lime, 98.
European Linden, 98.
European Maple, 95.
European Mountain Ash, 81.
Evergreen trees, 24.

F

Fagaceae, 55.
Fagus grandifolia, 55, **80, 81, 207.**
F. sylvatica, 56.
False Cypress, 35.
Fir, Balsam, 33.
Scotch, 28.
Silver, 34.
White, 34.
Fire Cherry, 76.
Flower, clusters, 15.
parts of, 14.
types of, 14.
Flowering Dogwood, 98.
Forests, distribution of, 9.
importance of, 7.
Foreword, 4, 5.
Forked veins, 14.
Fraxinus americana, 100, **184, 185, 187, 188, 257**
F. excelsior, 102.
F. nigra, 100, **186, 256.**
F. pennsylvanica, 100, **189, 258.**
F. pennsylvanica subintegerrima, 101, **183, 259.**
F. quadrangulata, 100, **260.**
Fruit, parts of, 15.

G

Ginkgoaceae, 37.
Ginkgo biloba, 37.
Glaucous Willow, 39.
Gleditsia triancanthos, 82, **148, 149, 150, 151, 235**
Golden Willow, 41.
Gray Alder, 53.
Gray Birch, 48.
Great Lakes-St. Lawrence Forest region, 10.
Green Ash, 101.
Gum, Black, 100.
Sour, 100.
Gymnocladus dioicus, 85, **152, 153, 237.**

H

Hackberry, 67.
Hackmatack, 29.
Hamamelidaceae, 73.
Hamamelis virginiana, 73, **134, 135, 226.**
Hard Maple, 89.
Hardwoods, 38.
Hawthorns, 76.
Hemlock, 33.
Hicoria, 46.
Hickory, Big Shagbark, 46.
Big Shellbark, 46.
Bitternut, 46.
Mockernut, 46.
Pignut, 46.
Red, 46.
Shagbark, 46.
Shellbark, 46.
White-Heart, 46.
Hippocastanaceae, 96.
Honey Locust, 82.
Hop Hornbeam, 52.
Hop-Tree, 87.
Hornbeam, 52, 53.
Horsechestnut, 96.
Hybrid Catalpa, 102.

I

mportance of forests, 7.
rish Juniper, 37.
ronwood, 53.

J

ack Pine, 25.
apanese Catalpa, 104.
udas-Tree, 85.
uglandaceae, 43.
uglans cinerea, 43, **60, 61, 62, 200, 255.**
J. nigra, 43, **63, 64, 67, 201, 255.**
June-Berry, 80.
Juniper, 35, 37.
Common, 37.
Irish, 37.
Juniperus communis depressa, 37.
J. communis hibernica, 37.
J. sabina, 37.
J. virginiana, 35, **39, 40.**

K

Kentucky Coffee-Tree, 85.
Key, how to use, 17.
to native evergreens, 17.
to native hardwoods, 18, 21.
Koster's Spruce, 33.

L

Larch, Eastern, 29.
European, 29.
Large-toothed Aspen, 42.
Larix decidua, 29, **20, 21, 22.**
L. europaea, 29.
L. laricina, 29, **23, 24.**
Lauraceae, 73.
Leaf, arrangement, 13.
kinds of margin, 14.
parts of, 13.
shapes, 13.
types of, 13.
venation, 14.
Leguminosae, 82.
Lime, American, 96.
European, 98.
Linden, American, 96.
European, 98.
Liriodendron tulipifera, 70, **117, 118, 119, 120, 223**
Locust Black, 86.
Honey, 82.
Lombardy Poplar, 43.
London Plane, 76.
Long-leaved Willow, 39.
Lumber, 7.

M

Maclura pomifera, 69.
Magnoliaceae, 69.
Magnolia acuminata, 69, **114, 115, 116, 222.**
M. soulangeana, 70.
Maidenhair-Tree, 37.
Malus coronaria, 80, **130, 131, 228.**
M. glaucescens, 80.
Manitoba Maple, 89.
Maple-leaved Plane, 76.
Maple, Ash-leaved, 89.
Black, 89.
Box Elder, 89.
European, 95.
Hard, 89.
Manitoba, 89.
Moosewood, 89.
Mountain, 89.
Norway, 95.
Red, 89.
Rock, 89
Silver, 89.
Soft, 89.
Striped, 89.
Sugar, 89.
Swamp, 89.
Sycamore, 95
White, 89.
Mixed Conifer-Hardwood type, 9.
Mockernut, Hickory, 46.
Moosewood, 89.
Moraceae, 68.
Morus alba, 68.
M. rubra, 68, **109, 110, 221.**
Mossy-cup Oak, 56.
Mountain Ash, American, 81.
European, 81.
Showy, 81.
Mountain Maple, 89.
Mugho Pine, 29.
Mulberry, Red, 68.
White, 68.

N

Names of trees, 11.
Nannyberry, 104.
Needle-leaved trees, 24.
Nettle-Tree, 67.
Northern Catalpa, 104.
Northern Evergreen Forest, 10.
Northern Hardwoods type, 9.
Norway Maple, 95.
Norway Pine, 25.
Norway Spruce, 32.
Nyssaceae, 98.
Nyssa sylvatica, 100, **178, 179, 249.**

O

Oak, Black, 56.
Bur, 56.
Chestnut, 56.
Chinquapin, 56.
Dwarf Chestnut, 56.
Dwarf Chinquapin, 56.
English, 64.
Mossy-cup, 56.
Pendunculate, 64.
Pin, 56.
Poison, 88.
Red, 56.
Rock Chestnut, 56.
Sessile, 64.
Swamp White, 56.
White, 56.
Oleaceae, 100.
Oriental Plane, 76.
Osage Orange, 69.
Ostrya virginiana, 52, **73, 74, 202.**

P

Papaw, 70.
Paper Birch, 48.

Peach-leaved Willow, 39.
Pedunculate Oak, 64.
Pepperidge, 100.
Picea abies, 33.
P. excelsa, 33.
P. glauca, 29, **27, 28, 29.**
P. mariana, 29, **25, 26.**
P. parryana, 33.
P. pungens, 33.
P. pungens glauca, 33.
P. pungens kosteriana, 33.
P. rubens, 29, **30, 30a.**
Pignut Hickory, 46.
Pin Cherry, 76.
Pin Oak, 56.
Pinaceae, 24.
Pine, Austrian, 28.
Jack, 25.
Mugho, 29.
Norway, 25.
Pitch, 28.
Red, 25.
Scotch, 28
Stone, 29.
Swiss Stone, 29.
Weymouth, 25.
White, 25.
Pinus banksiana, 25, **14, 15, 16.**
P. cembra, 29.
P. mugo mughus, 29.
P. nigra, 28.
P. resinosa, 25, **8, 9, 10.**
P. rigida, 28, **11, 12, 13.**
P. strobus, 25, **1, 2, 3, 4, 5, 6, 7.**
P. sylvestris, 28, **17, 18, 19.**
Pitch Pine, 28, **11, 12, 13.**
Plane-Tree American, 74.
London, 76.
Maple-leaved, 76.
Oriental, 76.
Platanaceae, 74.
Platanus acerifolia, 76.
P. occidentalis, 74, **127, 128, 129, 227.**
Plum, Canada, 76.
Wild, 76.
Poison Dogwood, 88.
Poison Elderberry, 88.
Poison Ivy, 88.
Poison Oak, 88.
Poison Sumach, 88.
Poplar, Aspen, 42.
Balm of Gilead, 42, 43.
Balsam, 42.
Carolina, 43.
Cottonwood, 42.
Large-toothed Aspen, 42.
Lombardy, 43.
Silver, 43.
White, 43.
Yellow, 70.
Populus alba, 43.
P. balsamifera, 42, **51, 193.**
P. balsamifera subcordata, 42.
P. canadensis eugenei, 43.
P. candicans, 43.
P. deltoides, 42, **52, 194.**
P. grandidentata, 42, **53, 192.**
P. nigra italica, 43.
P. tremuloides, 42, **50, 191.**
Prickly-Ash, 87.
Prunus americana, 76.
P. nigra, 76, **139, 141, 233.**
P. pensylvanica, 76, **136, 140, 143, 230.**
P. serotina, 76, **137, 142, 231.**
P. virginiana, 76, **138, 144, 232.**
Ptelea trifoliata, 87, **157, 158, 239.**
Pussy Willow, 39.

Q

Quercus alba, 56, **87, 88, 89, 213.**
Q. bicolor, 56, **82, 83, 215.**
Q. macrocarpa, 56, **92, 93, 94, 214.**
Q. muhlenbergii, 56, **85, 86, 216.**
Q. petraea, 64.
Q. palustris, 56, **101, 102, 212.**
Q. pedunculata, 64.
Q. prinoides, 56, **90, 91, 209.**
Q. prinus, 56.
Q. robur, 64.
Q. rubra, 56, **84, 95, 96, 97, 210.**
Q. sessiliflora, 64.
Q. velutina, 56, **98, 99, 100, 211.**

R

Red Ash, 100.
Red-Bud, 85.
Red Cedar, 35.
Red Cherry, 76.
Red Elm, 64.
Red Hickory, 46.
Red Maple, 89.
Red Mulberry, 68.
Red Oak, 56
Red Oak Group, 57.
Red Pine, 25.
Red Spruce, 29.
Retinispora pisifera, 35.
Rhus toxicodendron, 88.
R. typhina, 88, **240.**
R. vernix, 88.
Robinia pseudoacacia, 86, **145, 146, 147, 236**
Rock Chestnut Oak, 56.
Rock Elm, 64.
Rock Maple, 89.
Rosaceae, 76.
Roughleaf Dogwood, 98.
Roundleaf Dogwood, 98.
Rutaceae, 86.
Rowan-Tree, 81.

S

Salicaceae, 38.
Salix flowers, 39, **41, 42, 43.**
Salix twig, **190.**
Salix alba, 41.
S. alba vitellina, 41.
S. amygdaloides, 39, **45.**
S. babylonica, 41.
S. bebbiana, 39, **49.**
S. discolor, 39, **46.**
S. fragilis, 41.
S. interior, 39, **47.**
S. lucida, 39, **44.**
S. nigra, 39, **48.**
S. rostrata, 39.

Sand Bar Willow, 39.
Sassafras albidum, 73, **123, 124, 125, 126, 225**
S. variifolium, 73.
Savin, 37.
Sawara, Cypress, 35.
Scotch Elm, 67.
Scotch Fir, 28.
Scotch Pine, 28.
Seed, 15.
Service-Berry, 80.
Service-Tree, 81.
Sessile Oak, 64.
Shad-Bush, 80.
Shagbark Hickory, 46.
Sheepberry, 104.
Shellbark Hickory, 46.
Shining Willow, 39.
Showy Mountain Ash, 81.
Silver Birch, 48.
Silver Fir, 34.
Silver Maple, 89.
Silver Poplar, 43.
Slippery Elm, 64.
Soft Maple, 89.
Softwoods, 24.
Sorbus americana, 81, **229.**
S. aucuporia, 81.
S. decora, 81.
S. hybrida, 81.
Sour Gum, 100.
Southern Hardwoods Forest type, 9.
Southern White Cedar, 35.
Spruce, Black, 29.
Blue, 33.
Cat, 29.
Colorado, 32.
Koster's, 33.
Norway, 32.
Red, 29.
Swamp, 29.
White, 29.
Staghorn Sumach, 88.
Stone Pine, 29.
Striped Maple, 89.
Sugar Maple, 89.
Sumach, Chinese, 87.
Poison, 88.
Staghorn, 88.
Swamp Ash, 100.
Swamp Maple, 89.
Swamp Spruce, 29.
Swamp White Oak, 56.
Sweet Birch, 48.
Swiss Stone Pine, 29.
Sycamore, 74.
Sycamore Maple, 95.

T

Tamarack, 29.
Thuja occidentalis, 34, **36, 37, 38.**
Tiliaceae, 96.
Tilia americana, 98, **175, 177, 248.**
T. cordata, 98.
T. euchlora, 98.
T. glabra, 96.
T. platyphyllos, 98.
T. tomentosa, 98.
T. vulgaris, 98.
Toxicodendron radicans, 88.
T. vernix, 88.
Tree of Heaven, 87.
Tsuga canadensis, 33, **31, 32, 33.**
Tulip-Tree, 70.
Tupelo, 100.
Twig,markings on, 15, 16.
Winter, 15.

U

Ulmaceae, 64.
Ulmus americana, 64, **103, 104, 113, 217.**
U. campestris, 67.
U. fulva, 64.
U. glabra, 67.
U. montana, 67.
U. procera, 67.
U. racemosa, 64.
U. rubra, 64, **107, 108, 219.**
U. thomasii, 64, **105, 106, 218.**

V

Viburnum lentago, 104, **176, 253.**

W

Walnut, 43.
Weeping Willow, 41.
Weymouth Pine, 25.
White Ash, 100.
White Birch, 48.
White Cedar, 34.
White Elm, 64.
White Fir, 34.
White-Heart Hickory, 46.
White Maple, 89.
White Mulberry, 68.
White Oak, 56.
White Oak Group, 62.
White Pine, 25.
White Poplar, 43.
White Spruce, 29.
White Willow, 41.
Whitewood, 70, 96.
Wild Crab, 80.
Wild Plum, 76.
Willow, Beaked, 39.
Black, 39.
Crack, 41.
Glaucous, 39.
Golden, 41.
Long-leaved, 39.
Peach-leaved, 39.
Pussy, 39.
Sand Bar, 39.
Shining, 39.
Weeping, 41
White, 41.
Wire Birch, 49.
Witch-Hazel, 73.

Y

Yellow Birch, 48.
Yellow Poplar, 70.

Z

Zanthoxylum americanum, 87.